PULP & PAPER

C 3975-2
11/20/87

November 1987

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0700239798 C9 88 SEP88 07
196
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Latest in-use techniques, equipment

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Number 11

NOVEMBER

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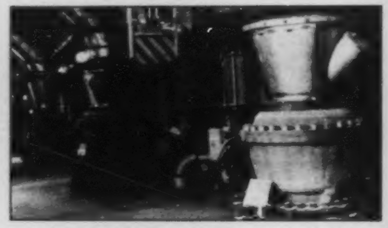

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

ABP

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BPA

Subscriptions & Address Change: Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of $55.00 a year in the U.S. All subscriptions to other countries: $75.00 a year, except Europe and Mediterranean, $85.00 (air service included). Single copy, $5.00, except Buyers Guide, $30.00. Photocopies of articles and complete microform volumes available through University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106.

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Sen[illegible]bscription correspondence to:
Circulation Department, PULP & PAPER,
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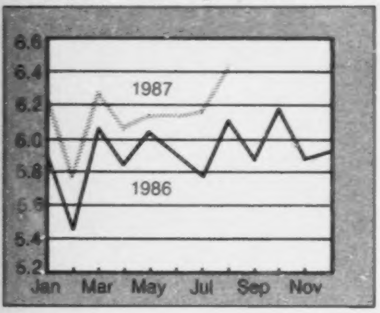
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.4 million tons in August, an increase of 5.4% over the same month last year, according to American Paper Institute data. After following a flat trend for the first seven months of the year, the production rate jumped sharply in August to a record 75.0 million tpy, API reported, up 4.3% from the record pace of a year earlier. Preliminary data for September show production holding close to the August high.

Among major grades, printing and writing paper production climbed 5.6% in August compared with a year earlier, thanks to continued strong demand for coated papers and uncoated free-sheet. Containerboard was strongest among the paperboard grades, as kraft linerboard output climbed 7.1% for the month and fiber box shipments continued at record levels, up 4.6% compared with August 1986.

Canadian newsprint shipments dropped to 785,000 metric tons in August, down 0.6% from the same month in 1986. Shipments for the year to date are still up 5.2% from last year, however. Woodpulp exports posted a 2.7% increase in August, raising the year-to-date total 2.3% ahead of last year. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	August	498	2.5	5,788	2.8
Uncoated groundwood (s)	August	125	-1.6	1,516	0.1
Coated paper (s)	August	591	6.5	6,730	10.6
Uncoated free sheet (s)	August	944	7.6	10,825	4.7
Other printing/writing	August	116	-1.7	1,364	-1.1
Total packaging and other paper (s)	August	412	-3.5	5,034	-1.7
Tissue	August	453	5.3	5,250	3.5
Total paper	**August**	**3,139**	**3.9**	**36,505**	**3.8**
Unbleached kraft paperboard	August	1,685	7.1	18,833	6.8
Semichemical medium	August	481	0.0	5,631	5.0
Bleached paperboard	August	377	10.2	4,428	3.3
Recycled paperboard	August	752	9.0	8,531	5.5
Total paperboard	**August**	**3,295**	**6.7**	**37,422**	**5.8**
Total U.S. paper and paperboard output	**August**	**6,434**	**5.4**	**73,038**	**4.0**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	July	5,111	8.5	59,215	4.5
Market pulp production	July	729	14.3	8,019	7.9
Wastepaper consumption at paper/board mills	July	1,453	10.1	17,417	4.9
Pulpwood consumption (cords)	July	8,195	4.9	93,967	3.0
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	August	24.977	5.3	197.380[6]	5.2
Containerboard inventories at U.S. box plants and mills	Aug. 1	2,497	4.5		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	July	1,004	-9.4	12,362	7.6
Imports of Canadian newsprint	July	707	-11.7	8,683[6]	4.1
U.S. paper exports (including products)	July	436	2.3	5,148	9.4
Exports of unbleached kraft linerboard	July	186	2.2	2,250	11.7
Exports of woodpulp	July	463	54.8	4,857	12.5
Norscan pulp inventories[4]	Aug. 31	1,049	-0.3		
Norscan pulp operating rates[4]	August	100%	105%	100%	98%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	August	785	-0.6	6,405[6]	5.2
Operating rates	August	98%	93%	97%	93%
Inventories held by U.S. consumers	Aug. 31	1,475	2.6		
Other paper/board shipments	August	539	5.7	4,221	6.2
Woodpulp shipments (export only)	August	683	2.7	5,313	2.3
Operating rates	August	98%	93%	97%	92%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Kraft paper: Demand still declining, but strong liner demand and shutdowns keep market tight

Grade structure: Unbleached kraft paper (UKP) is normally divided into four end uses: bag and sack, shipping sack, wrapping, and other converting. Bag and sack paper is the largest category, accounting for about 62% of total shipments, followed by multiwall shipping sacks, 23%; other converting, 12%; and wrapping, 3%. Basis weights for bag and sack paper range from 30 lb to 80 lb/3,000 ft^2, with the lower basis weights being used for small grocery and merchandise bags while 70 lb is most commonly used for grocery carryout sacks. Multiwall shipping sack paper is 50 lb or 60 lb. Extensible or air-dried paper may be used for shipping sacks requiring extra strength.

Production/capacity: UKP shipments declined 3% to 3.3 million tons in 1986, reflecting some improvement over the 7% decline in 1985. As in previous years, the "rationalization" of UKP capacity matched the decline in shipments, resulting in an operating rate of nearly 95%. Among the industry's capacity reductions, the largest shutdown was Champion International Corp.'s 236,000-tpy No. 5 swing machine at Pensacola, Fla., at the end of the third quarter for conversion to uncoated free-sheet. Georgia-Pacific Corp. converted No. 2 machine at Crossett, Ark., to uncoated free-sheet and Gilman Paper Co. converted UKP capacity at the St. Mary's, Ga., mill to uncoated free-sheet.

While the industry continued to reduce total capacity in 1987, some companies actually bucked this trend and increased capacity. The most notable event was the reactivation of the former Jacksonville Kraft mill by Stone Container Corp. in the first quarter. Jacksonville's 125,000-tpy No. 1 machine is producing 40- to 60-lb sack and multiwall grades.

For 1987, UKP shipments are expected to decline about 7% to 3.2 million tons due to weak demand in bag and sack grades. Consumption of unbleached kraft paper is expected to show a somewhat smaller decline in 1987 because of higher imports from Canada. The industry's operating rate for all of 1987 could be 94%.

Market segments. Grocery bag and sack paper shipments declined 4% to 1.9 million tons in 1986, and this year they will show about an 8% decline. Paper grocery carryout sacks continue to face stiff competition from plastic bags. Plastics' share of the grocery sack market has steadily increased during the past decade to reach about 25% in 1987.

Multiwall shipping sack paper volume dropped 6% to 747,000 tons in 1986, but shipments this year are expected to increase about 7%. Industry sources cite improvements in the farm economy, as well as strength in industrial and chemical markets, for the turnaround. Another factor is a favorable price relationship to heavyweight grocery sack paper, which is encouraging converters to use more multiwall paper. Wrapping and other converting uses for unbleached kraft papers increased 5% to 595,000 tons in 1986 and should show slight gains again this year.

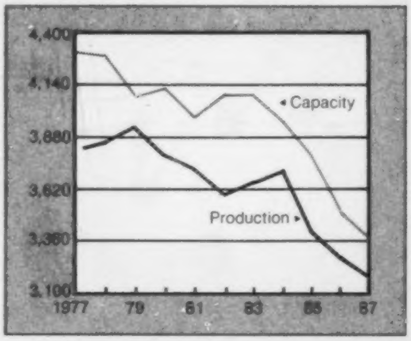
Pricing: UKP prices have escalated steadily during the past two years following heavy discounting pressure in 1985. The strong demand for linerboard from swing machines and the capacity reductions in unbleached kraft papers have allowed producers to announce price increases on a regular basis. This year, about 900,000 tpy of kraft paper is being produced on swing machines.

Heavyweight (70 lb) grocery sack paper prices have increased from a low of $260/ton in 1985 to about $425/ton in the last quarter of 1987. Similarly, multiwall (50 lb) kraft paper prices have increased from $360/ton to $490/ton during the same period. Prices of lighter-weight kraft paper grades (30 lb) have been less active because lighter-weights are less directly affected by strong demand for linerboard.

Year-end price history for 70-lb grocery sack paper is as follows: 1980, $280; 1981, $300; 1982, $240; 1983, $280; 1984, $330; 1985, $300; 1986, $365; 1987(3Q), $400.

Multiwall sack paper (50 lb): 1980, $375; 1981, $405; 1982, $360; 1983, $380/$410; 1984, $390; 1985, $360; 1986, $420; 1987(3Q), $450. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1986	1987e	1988e
Shipments	3,303	3,200	3,150
Capacity[1]	3,495	3,415	3,420
Utilization rate	94.5%	93.7%	92.0%
Imports	115	125	110
Exports	78	75	80
Apparent U.S. consumption	3,340	3,250	3,200
lb/capita	27.6	26.7	26.2
GNP ratio	0.90	0.89	0.89

e = estimate.

1. Capacity for 1986 adjusted for removal of 125,000-tpy Jacksonville Kraft machine.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Stone Container[1]	773	22.6
2. Union Camp	450	13.2
3. Georgia-Pacific[2]	340	10.0
4. Longview Fibre	325	9.5
5. International Paper	260	7.6
6. Champion Intl.[3]	195	5.7
7. Gilman Paper	165	4.8
8. Mid-America[4]	137	4.0
9. Gaylord Container[5]	121	3.5
10. Chesapeake	115	3.4

Market share of top five companies:
62.9%

Market share of top ten companies:
84.3%

Total U.S. capacity (1987):
3.415 million short tons

1. Reflects startup of former Jacksonville Kraft No. 1 machine.
2. Reflects shift of capacity to Palatka, Fla., and Toledo, Ohio, mills.
3. Reflects shutdown of Pensacola, Fla., No. 5 machine.
4. Acquired Weyerhaeuser's Pine Bluff, Ark., mill in 1986.
5. Acquired Crown Zellerbach's Bogalusa, La., mill in 1986.

NEWSPRINT

Producers try to raise prices

Most of the major newsprint companies throughout the U.S. and Canada have announced price increases to take effect with shipments on Jan. 1, making the movement that started with CIP Inc. and Bowater Inc. virtually unanimous.

In Canada, Abitibi-Price Inc. raised its price for Canadian customers effective Jan. 1 to C$750 from C$685, the same as an earlier announcement by Consolidated-Bathurst Ltd. Newsprint producers in British Columbia also announced price increases for Canadian customers. Effective Jan. 1, prices in Canada will be raised to C$685/metric ton from C$620. Joining the attempt were British Columbia Forest Products Ltd., Crown Forest Industries Ltd., and MacMillan Bloedel Ltd. Prices to British Columbian customers were last raised on Jan. 1 from C$585. Eastern Canadian prices had last gone up Apr. 1 from C$635.

In the western U.S., MacMillan Bloedel Ltd. started the attempt to hike prices, announcing that it would lift list prices $30 to $630/metric ton and eliminate a 3% "temporary competitive allowance" but keep a 5% discount for customers who purchase the full annual contract amount. Later announcements followed this pricing pattern. Producers in eastern U.S. markets have announced list levels are slated to rise on Jan. 1 to $650 from $610.

Champion International Corp. and Kimberly-Clark Corp. are not expected to raise prices until later in the second quarter as the two lagged behind the rest of the industry when most producers last raised prices on July 1. K-C's prices were last hiked on Aug. 1, while Champion's customers did not pay higher prices until Sept. 1. A number of market observers expect that the two producers will delay their price increases until Feb. 1 and Mar. 1, respectively, in order to keep a six-month lag time in between their price increases. ■

TABLE 1: **Newsprint—US$/metric ton delivered to eastern U.S.**

	First quarter	Second quarter	Third quarter	Fourth quarter
1984	500.00	500.00	535.00	535.00
1985	535.00	535.00	535.00	517.50
1986	517.50	507.50	517.50	525.00
1987	540.00	540.00	566.67	570.00

CIP to go ahead with newsprint mill at Gold River

CIP Inc. announced it would proceed with construction of a C$320-million greenfield newsprint mill at the site of its Gold River pulp mill on Vancouver Island in British Columbia. The company expects the mill to be online by the fall of 1989.

The new 230,000-metric-tpy paper machine will raise CIP's newsprint capacity to over 1.5 million tons, ranking it near top world producer Abitibi-Price Inc.'s approximately 1.8 million tons of newsprint capacity.

The paper machine itself will be a Beloit Bel Baie III twin-wire unit. A new chemi-thermomechanical pulp mill will be built to supply the furnish. In addition, CIP plans to expand the warehousing capacity at its nearby deep-water port facility, which can accommodate two ocean vessels at one time.

CIP's J.H. Whalen, executive vice president of marketing, noted that the site of the new mill gives the company the advantage of being able to serve customers from coast to coast in North America, as well as offshore. He also indicated that the new mill had received "encouraging support from the marketplace."

CIP's new newsprint mill will be one of three greenfield mills coming online on the West Coast alone by 1990. The other two are planned by Great Lakes Forest Products Ltd. (180,000 tpy) and Finlay Forest Industries Ltd. (216,000 tpy). In addition, MacMillan Bloedel Ltd. plans to restart a 65,000-tpy newsprint machine at Powell River, B.C., and Crown Forest Industries Ltd. is rebuilding two paper machines for a net increase in capacity of 50,000 tpy.

In other parts of North America, the rise in newsprint capacity will not be as significant, with only one new newsprint machine that is definitely planned in the East by Newsprint South Inc. (205,000 tpy). However, Southeast Newsprint Manufacturing Co. reportedly is close to making a decision on a 190,000-tpy greenfield newsprint mill.

The total of all of these projects would boost the total North American newsprint capacity by less than 7% by the year 1990. However, projects that are in the West will add up to a 20% jump in West Coast capacity to approximately 4.4 million tons from 3.7 million tons currently. This figure could increase even more with other producers, such as Smurfit Newsprint Corp. (*P&P*, October, p. 25), studying possible additions. West Coast U.S. consumption by newspapers is less than 500,000 tpy. Most of the remaining newsprint output is exported to such areas as Southeast Asia. ■

Publishers interested in building news mill in Alberta

Alberta forestry officials expect to receive a proposal shortly from a Vancouver, B.C., investor and a group of publishers interested in constructing the province's first newsprint mill. The consortium, headed by lawyer Ronald Stern and thought to include Southam Inc., is reportedly looking at a 220,000-metric-tpy facility that will cost C$360 million to build.

"The mill makes sense in terms of economies," said Stern, who is also one of the founders of Pacific West Equities Ltd., Vancouver publishers of local magazines. Southam publishes 15 daily newspapers and a financial weekly newspaper in Canada, and owns three large newspapers and one small one in Alberta. According to one estimate, Southam's newspapers consume 60% of the newsprint used in Alberta.

Stern refused to divulge the identities of his other partners. The consortium reportedly is linked to eight or nine major newsprint buyers, some of which are publishers and the rest are other types of end users. ■

ISSUE FOCUS: **CHEMICALS**

1987 HAS TURNED OUT TO BE ANOTHER BANNER YEAR FOR CHEMICAL SUPPLIERS

P&P's survey reports a lot of activity in pricing, expansion; many chemicals tight or in short supply due to strong pulp, paper production

By MICHAEL J. DUCEY, Technical Editor

The pulp and paper industry continues its upward climb: production figures released by the American Paper Institute (API) indicate sustained or steady growth during the first half of 1987 vs 1986 for pulp (3.7% vs 3.8%), paper (3.5% vs 2.8%) and paperboard (5.2% vs 4.9%). In Canada, the Canadian Pulp & Paper Assn. (CPPA) reports production increases for woodpulp at 7.5% over the first half of 1986, and paper and paperboard production up about 6.4%. This year is also shaping up to be one of the most profitable in history, as nearly all paper products have introduced price increases with great success. Not surprisingly, chemical suppliers have enjoyed a strong year of increased sales, and many sectors are scrambling to expand, in expectation of a continued strong market.

Among the star performers which have helped with chemical consumption are coated papers and paper-grade market pulp. API reports growth for coated paper at nearly 10%. Correspondingly, our survey found suppliers of kaolin, latex, and other polymers received a large boost in deliveries. Uncoated free-sheet production rose 3.4%, with a few alkaline papermaking conversions, and shipments of calcium carbonate, alum, and filling clays all fared well.

Market pulp production, softwoods in particular, gained in the U.S. (5.8%) and in Canada (9.1%), and operating rates (along with prices) seemed to be at a maximum. This contributed to increased consumption of sodium chlorate, chlorine, and caustic. Mechanical pulps jumped 6.1% in Canada and 2.7% in the U.S., and hydrogen peroxide and other aids had a full year of growth.

In the specialty areas, suppliers also found high interest. For pulping, oxygen extraction has been fully accepted, and prebleaching retrofits are currently on the rise (strong interest in the Pacific Northwest is reported). Sodium sulfite solutions for mechanical pulps are very popular, and many maufacturers have either tried to use it or are using it currently. Sulfur got a kick from emulsified products, which are used in the makeup of cooking liquor. Anthraquinone and other pulping specialties have only been applied in spots.

In papermaking, quality is being sought universally by end users, and chemicals are satisfying many needs. Modified starches are being consumed at higher rates. The mills concerned with runability are applying more biocides and defoamers in customized shipments. An indication of the strength of the industry and the economy itself is reflected in the use of colored paper, produced through addition of dyestuffs, which had a record year.

The pulp, paper and paperboard industry is a multi-billion-dollar market for the chemicals industry. By estimations from Frost & Sullivan, coatings and fillers represent close to 1 trillion pounds, bleaching agents are at 8.2 billion pounds, pulping additives are at 4.8 billion pounds, sizing components are at 4.3 billion pounds, forming aids are at 357 million pounds, and several others total close to another 100 million pounds. All told, inputs of hundreds of inorganic and organic materials run about 14 million tons. Roughly 65% require processing at the mill, although this is rapidly changing. The mills are seeking to streamline production, and the suppliers are gladly supplying products for the site-ready shipment.

In this year's survey, the larger commodities are listed by the sources, with comprehensive comments from suppliers and mills. Movement of suppliers and trends in usage are the focus of each listing. *Pulp & Paper* invites all interested parties to comment on the information provided for use in the 1988 chemical columns and the year-end survey.

TABLE 1: **Sulfur and sodium sulfite post best results among other pulping chemicals.**

Chemical	Consumption 1986 tons (000)	Consumption 1987 tons (000)	% change 1987-1986
Lime	1,190.0	1,290.0	+2.5
Soda ash	200.0	207.0	+2.5
Salt cake	510.0	515.0	+0.5
Sulfur	110.0	139.0	+4.0
Sulfuric acid	830.0	880.0	+2.5
Sulfur dioxide	50.0	56.0	+1.5
Sodium hydrosulfide	5.5	5.9	+1.0

PULPING CHEMICALS

CHLORALKALI

Sources: Nationally, 75% of chlorine production is accomplished by diaphragm cells, 17% by mercury cells, 3% by membrane cells and 5% by other technologies. There are 24 chloralkali producers at 50 locations with a total nameplate capacity of 35,144 tpd of chlorine and 36,425 tpd of dilute caustic. Chemical processing industries account for most of the chloralkali consumption (44% of chlorine, 34% of caustic), followed by pulp and paper (16% of chlorine, 24% of caustic), polyvinyl chloride, water treatment, and others.

Supplier forecast: Dow Chemical Co., the largest producer, has implemented a multimillion-dollar program aimed at increasing capacity while decreasing production costs and improving product purity. Its latest move concerns the debottlenecking of the plant at Freeport, Texas, where 550 tpd of chlorine should be available late in 1988. Dow also will open a small membrane cell demonstration plant (30 metric tpd) later this year, in hopes of learning more about this emerging technology. The Japanese and others here and worldwide have had tremendous success with this technique. In other supplier news, OxyChem has acquired DuPont's plant at Corpus Christi, Texas (1,260 tpd of chlorine, 1,420 tpd of caustic), and reports high operating rates for its new membrane cells at Taft, La. Niachlor, a joint venture of DuPont Corp. and Olin Corp., is nearing completion of the chloralkali unit at Niagara Falls, N.Y. (660 tpd of chlorine, 730 tpd of caustic). Startup is scheduled for December. Elsewhere, energy costs are reportedly rising in the Gulf Coast area, which may help to continue the strong price rises of the last two years. The latest price increases for caustic reflect regional market situations ($300/ton in the West, $200/ton in the East), as prices moved up $25/ton. Tight supply is forcing consumers, both with contract and without, to give proper notices (30 to 90 days) for modifications to orders. Most suppliers say prices will change on a quarterly basis into the foreseeable future. One technology note from the Univ. of Southern California finds production of chlorine possibly becoming cheaper. Instead of using the electrolysis of brine to produce coproducts, the process separates hydrogen chloride through burning with a catalyst and separating through chemical and physical means.

Mill demand forecast: Although new technologies have tried to uproot chloralkali products from pulp mills, pulp producers still feel that they are the most cost effective. Recently, the Environmental Protection Agency (EPA) reaffirmed federal guidelines on limitation of BOD_5 and color discharges by keeping mid-1970's legislation intact. This is sure to hold down oxygen delignification installations to a slow level, guaranteeing chlorine and caustic a home in the near future in chemical pulp bleacheries. In Canada, the situation is quite different, and turnover of systems appears imminent. Caustic may receive another boost as mills experience good results with modified cooking techniques.

SODIUM CHLORATE

Sources: Total North American capacity is approximately 844,000 tpy, with six commercial sites in the U.S. and 13 commericial sites in Canada. Output in Canada was

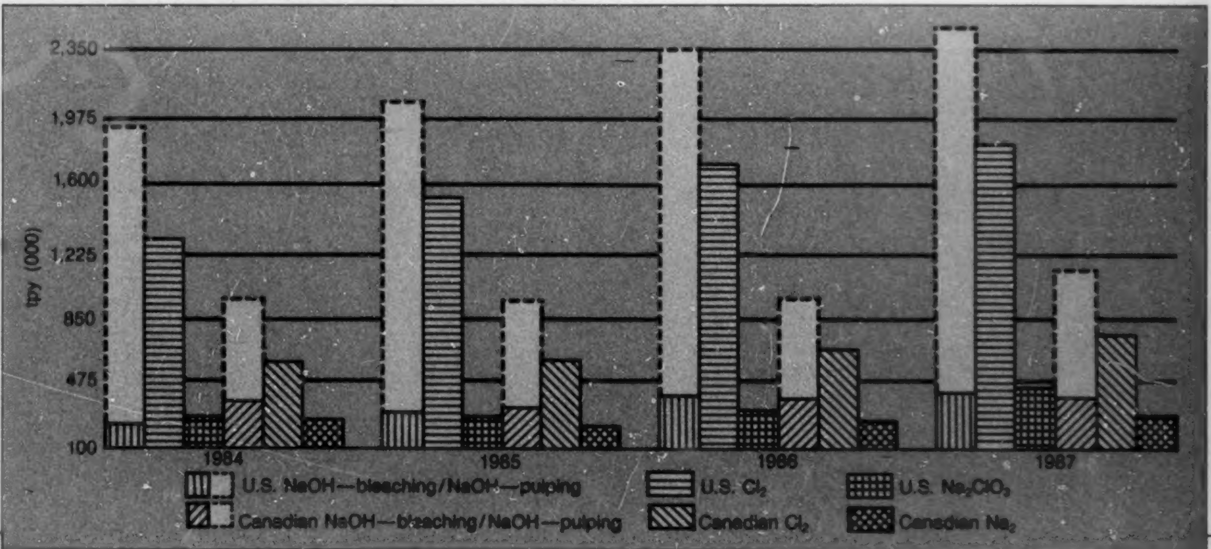


FIGURE 1: **Bleaching and pulping chemicals have shown steady growth since 1984.**

up over 18% for the first half of 1987 (influenced by strong exports to the U.S.), while U.S. plants are running at 95% operating rates. Both solution and crystal products are manufactured, the latter gaining in popularity because of the economics involved in shipment (particularly from Canada).

Supplier forecast: The prices for solution are currently $355/ton (freight equalized MacIntosh, Ala.), and crystal prices are $350/ton (average delivered cost). These reflect a rather balanced supply/demand situation, as suppliers continue to jockey for position in the current market as well as the future one. Spot customers are paying substantially higher prices, especially on the West Coast. Canada has had the majority of capacity changes over the last two years. The Alby-Olin joint venture started up in September 1986 (55,000 tpy). Canadian Oxy added 7,000 tpy at its Brandon mill earlier this year. QueNord Inc. opened its expanded facility in Magog, Que., in September 1987 in an effort to triple capacity over two years to 101,000 tpy. ERCO plans expansion and modernization projects that will lift capacity in North Vancouver, B.C., to 84,000 tpy; Buckingham, Que., to 70,000 tpy.

Mill demand forecast: There is currently a great deal of interest in expanding chlorine dioxide generating capacity. *Pulp & Paper Project Report* disclosed five sites announcing new equipment in the U.S. for 1987, with many projects planned for 1988 as well. Canada has also moved foward with several projects. For existing bleacheries, there is renewed interest in employing higher substitution rates in the chlorination stage for more efficient bleaching of pulp. In new or overhauled bleach plants (i.e., sequence splitting, etc.), technology of high-substitution ClO_2 seems to be part of the project.

HYDROGEN PEROXIDE

Sources: DuPont, FMC Corp. and Interox America have been joined in the North American market by Degussa Corp. and Atochem, companies from western Europe. Capacity is up to 275,000 metric tpy (100% basis).

Supplier forecast: Growth in capacity has not influenced prices as much as first thought in this boom market for hydrogen peroxide. Prices have remained steady at $0.325/lb (50% basis) for nearly three years, and demand (both real and potential) is keeping that level firm. Two plants began operation this year. DuPont's Maitland, Ont., facility reached full production early in 1987 at 80 million lb/year, making them North America's largest producer. Degussa Corp.'s Mobile, Ala., plant was just beginning operation at press time and is also slated for 80 million lb/year. Another plant in Canada, constructed by OxyChem Canada (jointly owned by French companies L'Air Liquide and Atochem) and expected to produce 44 million lb/year, is scheduled to be online this year. FMC, after pulling out of a project in Squamish, B.C., has decided to invest in a plant in Thailand. Many suppliers paint a rosy picture of the future, in which hydrogen peroxide will be the chosen oxidizer of Third World countries for water treatment and agricultural uses. Countries in the Far East have already adopted the chemical as such. In technology news, Degussa says hydrogen peroxide can be used in wet scrubbers for small-scale removal of SO_2 in stack gases.

Mill demand forecast: The bulk of hydrogen peroxide is used in bleaching mechanical pulps, although it does have a share in both chemical pulp bleaching and deinking. Mechanical pulp producers are turning to hydrogen peroxide as their chief component for whitening pulp, especially the manufacturers of market CTMP grades (which are commanding a good share of tissue and toweling markets and presently have a foothold in printing and writing grades). Systems use between 1% to 2% on o.d. wood in either one- or two-stage processes, combining with sodium hydrosulfite in some cases. Three large mechanical pulp plants are under construction in Canada, and two are being considered in the U.S. There has also been a fair amount of new newsprint and groundwood paper capacity announcements. In Europe, interest in mechanical pulp has spurred the announcements of at least two new hydrogen peroxide projects for next year. In chemical pulp bleaching, there has been moderate growth in hydrogen peroxide as a final polishing step for market pulp (for export, especially) and in use in extraction stages. Newly released evidence claims large efficiency gains in E_0 stages with addition of H_2O_2. In German sulfite mills, this technology has helped to eliminate first-stage chlorination, thus reducing effluent loads. One mill in the U.S. has adopted this technique.

OTHER SODIUM CHEMICALS

Sources: Two producers, Olin Corp. and Virginia Chemicals Inc., operate five plants producing sodium hydrosulfite products in the U.S. Morton Thiokol Inc.'s Ventron Div. operates a sodium borohydride facility in Danvers, Mass., and will shortly be joined by Covan Ltd., who plans to manufacture a similar product in Conshohocken, Pa. Sodium hydrosulfite capacity stands at 76,000 tpy, while sodium borohydride capacity, with the new unit (3 million lb/year) should be around 20,000 tpy.

Supplier forecast: Because of the success of mechanical pulp production and the demand for more brightness in groundwood grades, both chemicals enjoyed mild increases in shipments (about 4%) in North America. Because of the increased use of hydrogen peroxide and factors pertaining to cleaner wood for pulping (woodroom improvements, screening efficiency), the consumption per ton of pulp will probably decline. However, in an attempt to reach new brightness standards for some newsprint products and groundwood specialties, more attention is being focused on existing bleacheries that, for the most part, employ dithionite. Virginia Chemicals released a new product called SUS-PEN which can be delivered in a 33% suspension. Previously, product was shipped in 11% or 13% solutions. Prices of customized products did experience an increase at mid-year.

Mill demand forecast: As mentioned, in newer projects, the choice of mechanical pulp bleachers is primarily hydrogen peroxide, with support from dithionite. Some existing systems use H_2O_2 to polish dithionite bleached pulp. Price competition between the two might result in dithionite being the winner (for example, if energy costs shot up), and the tide might be reversed. There may be some great potential in nonchlorine bleaching of chemical pulps, should that technology ever be commercially explored.

OTHER PULPING CHEMICALS

Sodium sulfite is gaining acceptance in pulp production very quickly. Semichemical mills and thermomechanical mills are both using it, the former as a substitute for soda ash and sulfur and the latter for chemical treatment that increases pulp strength in papermaking. Consumption amounts vary (0.5% to 4% on o.d. wood), but mills are most happy with its site-ready applicability. The main supplier, Koppers Co. Inc., has recently expanded two plants (Petrolia, Pa., and Tuscaloosa, Ala.) to facilitate delivery of all grades.

Interest in **oxygen** is still very strong. Startups of oxygen delignification units, which consume ten times as much chemical as oxygen extraction systems, are the chief contributors to oxygen consumption growth. Some mills also use it to enrich treated water at discharge pipes and to boost capacity of lime kilns. In supplier news, Airco Industrial Gases is spending $135 million to build or expand separation units in Nashville, Tenn., Claymont, Del., Vancouver, Wash., and Trail, B.C. (concerning oxygen). Air Products & Chemicals was recently awarded a patent for a new membrane separation technique.

Sulfur, sulfur dioxide and **soda ash** used in sulfite pulping remain in a no-growth situation. Small production gains in Canadian sulfite pulping and use of emulsified sulfur for sulfate liquor makeup have helped offset any decline due to sulfite plant closures (one this year). The market for sulfur and soda ash is improving as far as price is concerned, with supply thinning and some recovery occurring in the bread and butter markets (construction, glass, chemical processing).

Sodium sulfate and **sodium hydrosulfide** are also stagnating. Tighter control of recovery loops (more efficient boilers, use of spent acid from chlorine dioxide generators) and use of products requiring less mill processing (like emulsified sulfur) and are reducing consumption of these once-popular liquor makeup chemicals. **Lime** usage is in a similar situation, with no growth available except in following industry production. But one bright spot for lime is installation of onsite calcium carbonate (see following section on papermaking chemicals).

Sodium silicate is slowly being replaced by customized formulations, whose chief component is **surfactants**. **Defoamers** in washing pulp are doing well, as many brownstock washing systems operate at overcapacity. **Sulfuric acid** was bumped in price during the second quarter due to strong export markets.

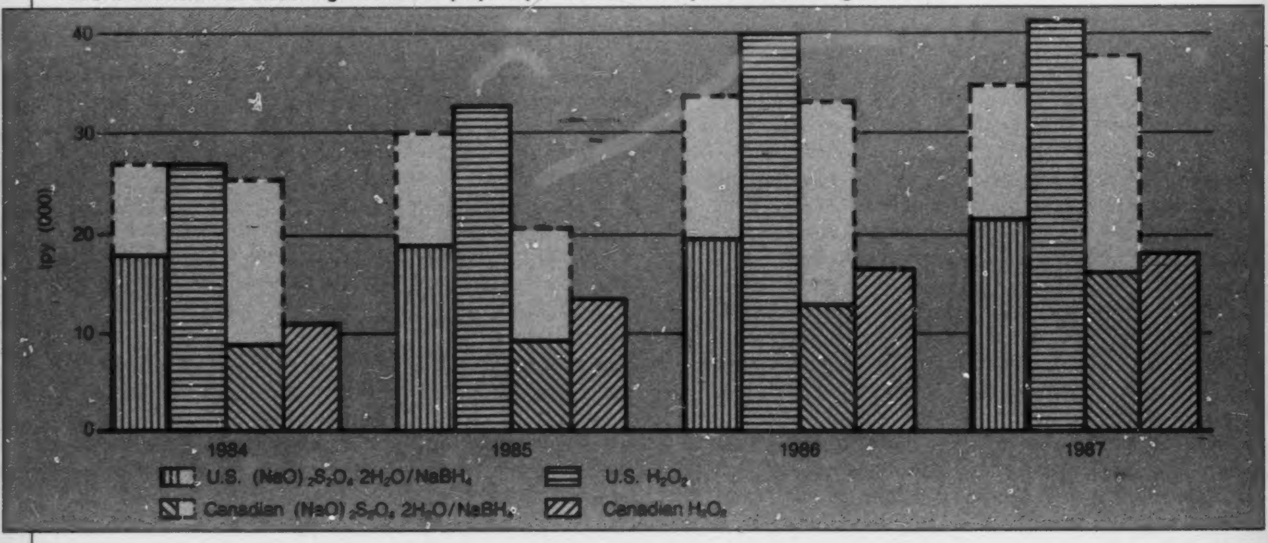


FIGURE 2: **Chemicals bleaching mechanical pulps experienced consumption increases again in 1987.**

PAPERMAKING CHEMICALS

ALUMINUM SULFATE

Sources: Several companies sell a variety of grades. Production of aluminum sulfate products stood at 3.2 million tons in 1986.

Supplier forecast: Price and consumption of all grades have been flat for several years, mostly due to downturns in usage by municipal water treatment facilities. One expansion has been announced. General Alum & Chemical Corp. will be building a $1.5-million plant (its third) and R&D center in Saukville, Wis. Completion of the 40,000-tpy (dry) plant is scheduled for late this year, while the R&D center will be finished in 1989.

Mill demand forecast: Traditionally, consumption increases of alum are tied to production of the industry, since nearly all systems use it for pH control while adding paper size. With several fine paper makers converting machines to an alkaline system or bringing on new machines incorporating this technology, the amount of alum consumed is reduced (on average 30%). Mills are also using polymers or lime for wastewater treatment, another area where alum was popular.

CALCIUM CARBONATE

Sources: Production of calcium carbonate reached over 1.5 million tons last year, the majority being natural ground grades. Two firms supply precipitated grades for papermaking applications.

Supplier forecast: After some mergers and acquisitions during the past two years, the dust has settled, resulting in a quite competitive marketplace. The greatest development is the announcement of five new onsite generators. Pfizer Minerals claims four of them. It has recently purchased a 42,000-ft² laboratory and office complex in Bethlehem, Pa., from Gulf & Western Industries. The space will be used to house a technical staff that has tripled over the last three years. The other generator supplier is Steel Bros., a subsidiary of the Canadian conglomerate. Because an oversupply situation persists in the market, an upward price movement has not been predicted in the near future. Discounting exists in a few regions.

Mill demand forecast: Since one or two machines are switching to or starting on alkaline papermaking every year, the use of calcium carbonate will grow (as long as it remains cheaper than fiber). Many mills are trying to use ground grades (fine and ultrafine) for a cost savings, and one source mentioned that several companies are researching onsite generation. Some suggest that coating applications are slowing, as filler applications grow stronger. Mills also comment that conversion to alkaline is not the problem, but running at full production with an alkaline system is the real challenge. Problems such as reduced wire and fabric life, foaming, and overloads in the whitewater system seem to be the biggest hurdles.

CORNSTARCH

Sources: There are 21 corn processing plants in the U.S., and four in Canada. Major new capacity has come onstream during the past two years, mostly for milling corn and drying products.

Supplier forecast: Prices for unmodified products (pearl starch) have never held to their list, and discounting of up to 50% is not uncommon. Overcapacity does not help the situation and neither does new product competition from potato starches (see below) and other surface sizing (polymers) and retention aids. Although enjoying market success with products such as high fructose corn syrup, the market for specialty starches (modified products) has been riding the long, rolling wave of end user demands for high-quality products. In the technology end, two equipment developments are helping to maintain starch use. One is the new starch cooker "in a pipe" by Jylharaisio, which is very popular in Europe for wheat and potato starches. Another piece of equipment pushed by suppliers is the new high-speed surface sizer. This device, now manufactured by four companies, incorporates the short dwelltime concept made popular by the new generation of blade coaters installed during the 1980s. In technology, Degussa Corp. is claiming a major breakthrough in the modification of starch. It has developed a process in which an inorganic catalyst is mixed with a reagent (an epoxide compound) and added to dry starch. The reagent chemical bonds to the starch, giving a cationic charge. The advantages are said to be achievement of a higher yield of cationized starch, lower investment of conversion equipment, and no effluent. Starch is also being investigated for use in the production of a biodegradable film for the fast food industry.

TABLE 2: **Dyes lead the pack in select papermaking and coating chemicals.**

Chemical	Consumption 1986 tons (000)	Consumption 1987 tons (000)	% change 1987-1988
Dyes	11.5	14.0	+8.5
Polyvinyl alcohol	10.1	11.5	+7.0
Polyvinyl acetate	85.0	87.5	+2.0
Surfactants	22.0	26.5	+4.5
Defoamers	59.0	66.0	+3.0
Biocides	8.0	9.5	+10.0

Mill demand forecast: Mills have been more interested in the ethylated and oxidized grades, and the cationic and amphoteric grades for wet end addition. They are easy to use and contribute to the overall paper quality improvements across all grades. Wet end addition is usually below 5-lb/ton rates for printing and writing grades. However, larger amounts are common in board production.

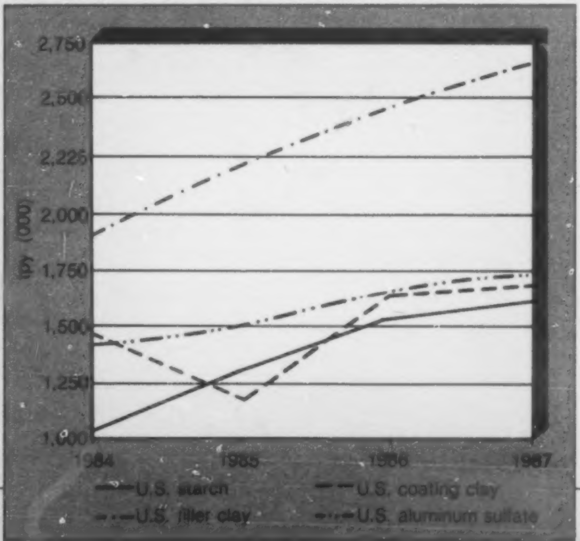
Potato starch: Historically consumed in Europe, these products are now being applied in paper machine wet ends as retention and drainage aids and as a strength enhancer in finished paper. A.E. Staley Manufacturing Co. and Nalco Chemical Co. currently market these products in North America.

KAOLIN

Sources: The vast majority of clay mined and processed in the U.S. comes from the state of Georgia. Seven companies operate in 14 locations, where nearly 11 million tons were produced last year.

Supplier forecast: Product lines of kaolin grades have spread fantastically during the past three years. Calcined clays have also gained with the squeeze in titanium dioxide supply. As has occurred in the industry itself, kaolin grades have experienced a split in their consumption. The value-added grades (upper end) have been accepted for the more expensive paper grades, while lower class grades have been more inclined to use lower grades of kaolin in combination with other products. Prices have moved up nicely over two years, as demand has been strong. Two manufacturers have expanded or modernized their facilities for value-added products and additional capacity. Most recently, Engelhard Corp. announced plans for $40 million of work on its Gordon and McIntyre plants, projects set for completion in 1988.

FIGURE 3: **Strong pace maintained for common papermaking and coating chemicals this year.**



Mill demand forecast: As more kaolin products become available, industry use will increase. Modernizations at manufacturing sites improve product uniformity and quality, which is what the mills are interested in. Both dry and slurried products are being used, depending on distance from the chosen supplier. As fiber becomes more expensive and scarce and as coatings are relied upon for superior printing surfaces, consumption of kaolin is sure to be on the rise. In Europe, Georgia kaolin products are being made more available through installation of shoreline slurry plants. ECC International Ltd. and Thiele Kaolin Co. have already erected and are operating such facilities on the Baltic and English channel.

TITANIUM DIOXIDE

Sources: Production of titanium dioxide did not quite reach 1 million tons last year, but it came very close. Imports are on the rise, as domestic production, hurt by environmental constraints, cannot fulfill domestic demand. Eight locations produce TiO_2, owned by four companies. Canada has two suppliers.

Supplier forecast: Prices have been on an upward climb since even before the industry turnaround due to the rising interest in titanium products in general (for defense products, for example) and through capacity reduction in the U.S. The processing of TiO_2 is changing in the U.S., but conversion is slow and hampered by a strong market for products. Consequently, many companies (foreign and domestic) have chosen to build plants offshore. In the U.S., SCM Corp. has decided to expand its Ashtabula, Ohio, No. 2 plant by 18,000 tpy at a cost of $18 million. DuPont has chosen the offshore route and plans new ventures in Taiwan, Rep. Korea and Brazil. SCM is expanding plants in England and Australia. Kerr-McGee Chemical Corp. is hinting at expanding its Hamilton, Miss., plant by 21,000 tpy, but it remains a partner in projects in Saudi Arabia and Rep. Korea. The Tioxide Group, based in Britain, is expanding its Sorel, Que., plant by 10,000 metric tpy; its French plant by 25,000 metric tpy. NL Chemicals is starting up a plant in Varennes, Que. (40,000 metric tpy), raising its Canadian output to 76,000 metric tpy. A Japanese player, Ishihara, is building a 36,000 metric tpy plant in Singapore.

Mill demand forecast: Papermakers are seeking alternatives and substitutes for TiO_2 for cost and supply reasons. It is the most effective opacifying chemical, but extenders and enhancers are literally saving the industry's use of them. Plastic pigment, latex, and calcined clay are helping TiO_2 in manufacturing. As end users and new paper products push higher quality, TiO_2 will still be a major chemical input. But chances are it will be imported and more costly.

OTHER PAPERMAKING CHEMICALS

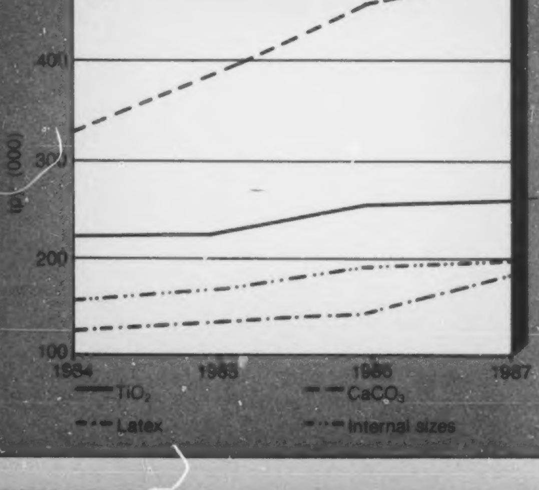
Dyestuffs have had tremendous growth over the past two years. The conversion of handling systems, to facilitate liquid products, has been a major influence on their consumption increases across all grades. Dyestuffs help mills to manufacture the "just-in-time" order, and they decrease production cost through less waste, cleanup, and handling.

Latex has also had a great year. These products have contributed to the improved printing quality of coated grades, with less preparation time and less cost. Recently, price pressure has forced some suppliers to reevaluate list prices (currently $0.80/lb), as discounting is up around 25%. New products are also hammering away at latex, with some success in some paper grades, particularly board. In an offshore development, Dow is building a 30,000-tpy plant in Hanima, Finland, in support of all the innovative coated paper expansion there.

Rosin size is in a similar situation as its additive brother, alum. Some upward price movement was recorded during the third quarter when Akzo raised its prices across the board by almost $0.05/wet lb. Tenneco started up a rosin plant in Charleston, S.C., with a capacity of 30,000 tpy. ■

Acknowledgement: P&P wishes to acknowledge Corpus Chemical Reports, Chemical Week, Chemical Business, C&E News, Chemical Marketing Reporter, *and* Chemical Engineering *for their help in gathering information for this report. We also extend our appreciation to all the companies mentioned here for their support.*

FIGURE 4: **Titanium dioxide hits capacity snag, calcium carbonate and latex show continued success.**



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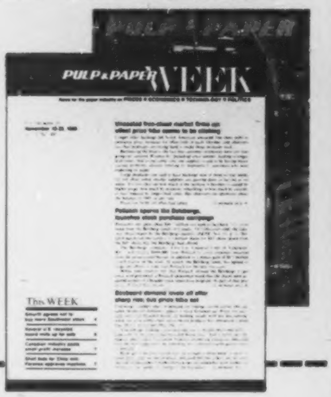

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(Photo courtesy AGEMA Infrared Systems, Secaucus, N.J.)

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News, Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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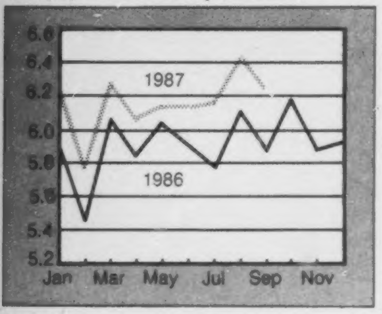
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.2 million tons in September, up 6.2% from the same month in 1986, according to American Paper Institute data. Production continued along the rising trend line it has followed all year, as new records were set for both third-quarter and nine-month performance. On a seasonally adjusted basis, paper production was up 4.0% compared with 1986, to 36.5 million tpy, while paperboard climbed to 37.2 million tpy, up 6.1% from the previous year. Total paper and board were up 6.1% overall compared with 1986.

Among major grades, coated papers continued to lead the way, with production for the first nine months up 10.3% from 1986. Containerboard production for domestic use was up 7.7%, to 22.9 million tpy, while fiber box shipments set new records for the month and quarter. Exports of unbleached kraft linerboard were up 13.8% through August.

Canadian newsprint shipments totaled 785,000 metric tons in September, down 0.6% from the previous year. Woodpulp exports climbed 2.7% to 683,000 tons. Operating rates for both woodpulp and newsprint stood at 98% for the month, up from 93% in September 1986. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
***PAPER & PAPERBOARD PRODUCTION*[1]**					
Newsprint	Sept.	494	6.9	5,803	3.2
Uncoated groundwood (s)	Sept.	126	-4.5	1,526	0.2
Coated paper (s)	Sept.	591	6.5	6,784	10.3
Uncoated free sheet (s)	Sept.	926	6.2	10,863	5.0
Other printing/writing	Sept.	117	2.6	1,376	0.1
Total packaging and other paper (s)	Sept.	413	-2.8	5,034	-1.6
Tissue	Sept.	436	5.1	5,253	3.8
Total paper	**Sept.**	**3,103**	**4.3**	**36,640**	**4.0**
Unbleached kraft paperboard	Sept.	1,613	12.2	18,871	7.3
Semichemical medium	Sept.	470	4.4	5,631	4.9
Bleached paperboard	Sept.	348	2.1	4,426	3.9
Recycled paperboard	Sept.	705	5.4	8,523	5.5
Total paperboard	**Sept.**	**3,135**	**8.2**	**37,452**	**6.1**
Total U.S. paper and paperboard output	**Sept.**	**6,238**	**6.2**	**74,091**	**5.1**
***PULP, WASTEPAPER & FIBER*[2]**					
Total U.S. woodpulp production	August	5,083	3.7	59,438	4.6
Market pulp production	August	707	4.7	8,077	7.2
Wastepaper consumption at paper/board mills	August	1,539	10.7	17,549	5.5
Pulpwood consumption (cords)	August	7,729	1.9	93,815	2.8
***CONVERTED PRODUCTS STATISTICS*[3]**					
Corrugated box shipments (billion ft^2)	Sept.	25.925	5.9	223.387[6]	4.8
Containerboard inventories at U.S. box plants and mills	Sept. 1	2,433	3.8		
***INTERNATIONAL TRADE*[2]**					
U.S. paper imports (including products)	August	1,003	0.2	12,322	6.7
Imports of Canadian newsprint	August	676	-5.3	8,612[6]	2.9
U.S. paper exports (including products)	August	486	23.4	5,233	15.6
Exports of unbleached kraft linerboard	August	219	28.8	2,297	13.8
Exports of woodpulp	August	390	-6.7	4,835	9.8
Norscan pulp inventories[4]	Sept. 30	856	-7.0		
Norscan pulp operating rates[4]	Sept.	94%	100%	105%	98%
CANADIAN STATISTICS*[5] *(reported in metric tons)					
Total newsprint shipments	Sept.	785	-0.6	6,405[6]	5.2
Operating rates	Sept.	98%	93%	97%	93%
Inventories held by U.S. consumers	Sept. 30	1,475	2.6		
Other paper/board shipments	Sept.	539	5.7	4,221	6.2
Woodpulp shipments (export only)	Sept.	683	2.7	5,313	2.3
Operating rates	Sept.	98%	93%	97%	92%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Newsprint: Sellers' market through 1989, as capacity catches up with consumption

Grade structure: Newsprint is commonly sold in the U.S. in 28 lb to 32 lb, although there has been some shift to the lighter basis weights. Standard newsprint, though, is considered to be 30 lb. Typically, brightness is in the 55 to 61 range. Of total newsprint consumed in the U.S., 62.2% was used by daily newspapers in 1986. The remainder was sold to customers that included weeklies, commercial printers, shopping news, comic magazines, and government publications, according to the American Newspaper Publishers Assn.

Production/capacity: Newsprint output was again breaking records in 1987, after a record year in 1986. U.S. mill shipments through the first ten months of 1987 were up 3.2% from the previous year, according to the American Paper Institute. Canadian production through the first three quarters was up almost 5%. At the same time, U.S. consumption rose 2.8% compared with the same three quarters in 1986.

Canadian mills supplied 57.1% of U.S. newsprint requirements in the first nine months of 1987, up slightly from 56.5% a year earlier, according to the Canadian Pulp & Paper Assn. This was surprising considering mill downtime due to strikes or lockouts in Canada was nearly 60,000 tons higher in the first eight months of 1987 than during the same period a year earlier, industry reports indicated.

U.S. imports from areas other than Canada, however, remained stable in 1987 from the prior year, representing about 2.5% of total imports through the first three quarters. At the same time, U.S. domestic sources of supply also remained flat at about 40%.

Outlook: Industry forecasts indicated newsprint consumption should be up at least 2.3%, but probably closer to 3%, in 1987. In 1988, such factors as the U.S. presidential election and the Olympics in Calgary, Alta., should boost newsprint sales higher than normal. Some estimates are even higher, but a possible recession in 1988 following last October's stock market decline is adding some caution. Usage may also be limited by supplies, and rising prices could cause publishers to conserve their newsprint supplies.

Newsprint capacity in Canada is expected to rise by an annual rate of less than 1% between 1986 and 1989, according to CPPA. In the U.S., expansions will be somewhat greater during this time. According to figures from API, capacity will rise by 1.7% a year between 1986 and 1989, but jump by 8.8% between 1989 and 1990 when capacity will reach an estimated 6.64 million tons.

Declining inventory levels and minimum capacity additions indicate a strong supply/demand pattern well into 1988, unless a poor economy depresses newsprint demand in the U.S. While newsprint demand should rebound in the early 1990s, new supply remains a concern—with more than 1 million tons of new capacity expected to start up in North America by 1991.

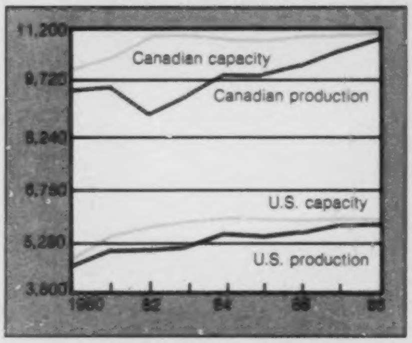
Pricing: After raising prices twice over the prior 12 months, most producers in the fourth quarter of 1987 were gearing up for a Jan. 1, 1988 price hike. Champion International Corp. and Kimberly-Clark Corp., however, were not expected to raise prices until February or March. After two years of declining transaction levels, prices started to rise on Oct. 1, 1987 but the announced price hike to $570/metric ton (in the East) was not fully implemented until Jan. 1, 1987. On July 1, 1987, prices rose to $610 and were slated to go up to $650 on Jan. 1, 1988.

Industry analysts expected the price of newsprint to climb as high as $700 in 1988. Brian Topp of Capital Group Securities Ltd. projected a price hike to $650 at the beginning of 1988, followed by a further increase to $700 in the second half of 1988, and a third boost to $750 by the first half of 1989, barring a recession.

List price history is as follows (U.S. East, contract, year-end, per metric ton): 1974, $259; 1975, $284; 1976, $314; 1977, $331; 1978, $353; 1979, $413; 1980, $441/$470; 1981, $500; 1982, $468; 1983, $500; 1984, $535; 1985, $535; 1986, $500/$535; 1987, $500/$570.

Markets: Canada's market share in the U.S. was 57.0% in 1986 compared with 57.3% for 1985 and 56.9% for 1984. Canada has supplied about 57% of U.S. demand for several years. ■

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1986	1987e	1988e
U.S.			
Production[1]	5,630	5,800	5,945
Capacity[1]	5,804	5,941	6,013
Utilization rate	97.0	97.6	98.9
Apparent U.S. consumption	13,826	14,400	14,764
lb/capita	115.1	118.2	120.0
GNP ratio	3.71	3.74	3.73
Canada			
Production[2]	10,238	10,657	10,923
Capacity[2]	10,896	11,051	11,199
Utilization rate	94.0	96.4	97.5

e = *Pulp & Paper* estimate.
1. American Paper Institute
2. Canadian Pulp & Paper Assn.

TOP U.S. PRODUCERS *(000 tpy)*

Company	Annual capacity U.S.	Canada	Total	Market share (%)
1. Abitibi-Price	385	1,909	2,294	13.5
2. CIP	—	1,207	1,207	7.1
3. Bowater	942	234	1,176	6.9
4. ConBath	—	1,022	1,022	6.0
5. Kruger	—	884	884	5.2
6. Champion[1]	831	—	831	4.9
7. K-C[2]	445	378	823	4.8
8. Boise[3]	534	271	805	4.7
9. Ontario	—	787	787	4.6
10. MacBlo	—	779	779	4.6

Market share of top five companies:
38.7%

Market share of top ten companies:
62.4%

Total North American capacity (1987):
16.992 million tons

1. Includes Catawba Newsprint Co. (51.0% owned), Calhoun, Tenn.; and Bowater Mersey Paper Co. Ltd. (51.0% owned).
2. Includes Spruce Falls Power & Paper Co. Ltd. (50.5% owned).
3. Includes Boise Southern Co., DeRidder, La.

SALES & EARNINGS

U.S. paper industry earnings increase 57.2%

The U.S. pulp and paper industry enjoyed earnings during the third quarter that were 57.2% above year-earlier levels on a 24.7% improvement in sales, a survey of 30 companies by *Pulp & Paper* revealed. This follows a 75% increase in profits during the second quarter. Most industry executives said they expected healthy earnings in the fourth quarter as well—if anyone on Wall Street was paying any attention.

It was hard for most paper companies to find anything to complain about in the third quarter. Producers of market pulp, linerboard, and newsprint continued to reap the benefits of strong demand and the weak dollar, and fine paper and tissue markets strengthened. Even some companies that are market pulp buyers managed to show earnings gains. The third quarter was noteworthy for the large number of price increases that were announced or implemented during the period.

Weyerhaeuser Co. enjoyed earnings more than two times larger than the year-earlier period, which was hurt by a strike. A company spokesman said that Weyco's pulp and paper mills were running flat-out and that strength in the export log market also aided earnings.

Champion International Corp. said that operating income from its paper segment was $137 million in the third quarter compared with $114 million a year earlier. The company attributed the earnings gains to a strong showing in all its business segments in addition to its continued cost cutting and improvements in productivity. The company also said that the profits from its packaging business increased substantially because of the continued improvements in price, volume, and productivity for linerboard and kraft paper.

Georgia-Pacific Corp. had the most sales of any company during the third quarter at $2.4 million. T. Marshall Hahn, chairman and CEO, commented, "Our pulp and paper segment reported operating profits of $92 million, up 80% from the 1986 period and an all-time high for the third consecutive quarter. Our timely mill improvements and upgrades have enabled us to take advantage of stronger export and domestic markets, which have had a significant impact on our recent performance."

International Paper Co.'s earnings improved 12.1%, while sales were up 66% to $2 billion. The results include those of Hammermill Paper Co. John A. Georges, chairman and CEO of IP, said that higher volume and a more favorable pricing structure for most of IP's products were the main reasons for the good showing. He added that the outlook for the fourth quarter is favorable and "the impact of labor disputes at four of our facilities is diminishing. The market is good and we anticipate strong operating rates and pricing levels given a continuation of the economic trends now in place."

James River Corp. ended its first quarter on July 26, and earnings were down 9.6% from the year-earlier level. The company blamed the decline partly on a higher effective tax rate and on lower results in tissue and towel, communication paper, packaging products, and specialty paper. Especially hard hit by high pulp prices

TABLE 1: **U.S. paper industry results.**

	Third quarter ($000)			
Companies	**Sales**	**Change 1987/86**	**Earnings**[1]	**Change 1987/86**
Boise Cascade Corp.	$996,960	5.7%	$50,390	280.6%
Bowater Inc.	303,906	28.0	23,010	98.7
Champion International	1,198,987	7.9	88,694	38.9
Chesapeake Corp.	179,417	10.9	6,805[2]	9.9
Consolidated Paper Corp.	188,236	19.2	22,042	9.2
Federal Paper Board Co	237,674	7.1	21,124	112.9
Fort Howard Paper Co.	469,683	4.4	45,421	6.9
Georgia-Pacific Corp.	2,424,000	27.0	118,000	21.7
P.H. Glatfelter Co.	120,719	75.7	13,457	49.5
Great Northern Nekoosa Corp.	664,600	29.2	55,700	61.0
International Paper Co.	2,000,000	66.7	102,000	12.1
James River Corp. (7/26)	1,179,216	10.2	41,812[2]	−9.6
Jefferson Smurfit Corp.	282,701	17.8	26,057	234.8
Kimberly-Clark Corp.	1,223,200	14.9	84,100	33.5
Longview Fibre Co. (7/31)	144,448	11.6	16,938	76.1
Louisiana-Pacific Corp.	531,800	30.5	42,600	91.9
Mead Corp.	1,110,500	32.6	97,400[2]	n.m.
Mosinee Paper Corp.	55,658	11.7	2,088	101.9
Pentair Inc.	198,474	21.6	4,560	43.9
Pope & Talbot Inc.	113.528	45.5	7,077	65.4
Potlatch Corp.	246,807	−1.3	22,604	35.1
Scott Paper Co.	1,034,000	26.1	58,500	53.1
Sonoco Products Co.	344,435	43.2	15,674	20.1
Stone Container Corp.	907,000	64.9	44,500	270.8
Temple-Inland	419,100	25.6	38,200	90.0
Union Camp Corp.	583,263	13.1	56,537	55.2
Wausau Paper Mills Co. (5/31)	251,371	11.8	12,047	4.7
Westvaco Corp. (7/31)	481,517	4.0	43,162	66.4
Weyerhaeuser Co.	1,819,882	30.2	126,123	102.6
Willamette Industries Inc.	376,787	25.5	31,954	49.8
Total	**[illegible]**	**24.7%**	**$1,318,576**	**57.2%**

n.m.—Not meaningful.

[1] Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.

[2] **Chesapeake:** Excludes a net charge of $3.2 million from sale of Plainwell. **James River Corp.:** 1987 quarter excludes a $5.5-million gain from insurance settlement involving equipment damaged by boiler explosion at Old Town, Maine, mill. **Mead Corp.:** 1987 quarter includes pretax gain of $42.8 million from sale of six corrugated container plants and Mead's 50% interest in a linerboard mill.

were the nonintegrated tissue and specialty paper segments.

Containerboard demand soaring. Stone Container Corp.'s earnings for the first nine months were up an astronomical 864% over the year-earlier period. Net income for the third quarter alone exceeded the company's former record for annual net income. Roger W. Stone, chairman, president, and CEO, said, "Demand for our products continues to be exceptionally strong. Industry shipments of corrugated containers were up 5.6% in the quarter and 4.8% for the nine months, both of which are records. We expect this level of demand to continue and to push the limits of industry capacity. Given this scenario, we anticipate that our company will continue to set new records for sales and earnings."

Boise Cascade Corp. had the most improved results of the companies surveyed with earnings rising 280% over year-earlier levels. While this was partially due to a strike endured by Boise's Rumford, Maine, mill during third-quarter 1986, this year's results are also due to "improved efficiency, better markets for virtually all of its paper products, and continued strong markets for its building products," John Fery, chairman and CEO said. He also noted that corrugated container prices improved and volume was strong, but profit margins continued to be squeezed as box price increases lagged price increases for linerboard.

Union Camp Corp.'s earnings were about 55% ahead of last year. Gene Cartledge, chairman and CEO, attributed the gain to "strong demand for paper and packaging, high operating rates in paper and board mills, and improving prices for many products." Cartledge predicted that results for the fourth quarter and the year will be excellent since white paper prices are expected to improve and the full impact of the announced container price increases will be felt.

Sonoco Products Co. enjoyed an earnings increase of 20% on a 43% improvement in sales. The results include the April acquisition of the consumer packaging division of Boise Cascade Corp. "We anticipate significant savings by combining several of the Sonoco and former Boise operations, and that process is under way," president C.W. Coker reported.

John R. Kennedy, president of Federal Paper Board Co. Inc., said, "Improved market pulp earnings were the major contributor to the record earnings in the third quarter, with wood products contributing significantly better results." He noted that bleached board and packaging markets were moderately better, while recycled paperboard and printing papers had lower earnings. Further improvements are expected in bleached board because of the announced price hike and the startup of capital projects at Federal's Augusta, Ga., mill slated for late this year and early next year. Recycled board is still struggling with high wastepaper prices.

Publication paper demand strong. Mead Corp. announced that before nonrecurring gains, its third-quarter earnings from continuing operations of $54 million set a record for the quarter and were 33% higher than the year-earlier period. Mead said that demand for coated papers continued to increase during the third quarter and most of its product lines remain on allocation, including the new Signature line that it introduced in September. Orders for Mead's uncoated and carbonless papers were also very strong during the third quarter. Coated board sales were approximately 9% ahead of last year's figures, and the product continues to remain on allocation. Corrugating medium for shipping containers remains sold out, and prices increased during the third quarter, the company reported.

Bowater Inc. enjoyed a 98.7% earnings increase. Anthony P. Gammie, chairman and CEO, said, "Not only did the glut in lightweight coated paper that was anticipated by some not occur, but the upturn was actually quite sharp."

Tissue producers profit too. Scott Paper Co. had the most improved earnings in the tissue sector with a 53% gain over the year-earlier period. Philip E. Lippincott, Scott's chairman and CEO, stated, "The company's record sales and earnings reflect sharply higher sales volume and earnings for the S.D. Warren subsidiary and strong increases in unit sales for the Scott Worldwide personal-care business." He noted that U.S. tissue manufacturing operations have been disappointing so far this year in light of "very strong volume increases." In addition, he stated that consumer advertising and promotion expenses are also continuing at a "somewhat higher than planned level."

Kimberly-Clark Corp. had a 33.5% increase in earnings. CEO and chairman Darwin Smith noted that "increased sales volumes for most consumer products, including the higher selling prices for disposable diapers, aided K-C's performance in the third quarter."

Fort Howard Corp.'s earnings rose 7% for the period. Chairman and CEO Paul J. Schierl said that the company's tissue business continues to do well: "Operating margins in 1987 are ahead of last year's levels, and volume is at an all-time high." He said that construction of the second recycled tissue machine to be installed at the Savannah River mill in Georgia is on schedule, and the company expects to start up the unit during first-half 1988. Schierl said the Savannah project is running about $30 million under budget. ■

Canadian earnings aided by pulp and newsprint markets

Canada's paper and forest products industry enjoyed a 95.2% increase in earnings for the third quarter on a 16.5% improvement in sales compared with the year-earlier period. Results continued to benefit from strong demand and rising prices for market pulp and newsprint. However, the weak U.S. dollar, some softness in fine paper and lumber prices, and the 15% export tax levied on softwood lumber shipments to the U.S. were negative factors cited by some companies.

Noranda Forest Inc.'s profits during the quarter jumped 160% compared with the strike-impaired 1986 period. The company said market pulp and newsprint were particularly strong, while printing and writing paper experienced some weakness, especially in the free-sheet grades. The company also said that order backlogs and sales volumes improved over the last two months. Noranda also said that the cost of British Columbia's new stumpage charges could not yet be calculated but commented, "at first blush, the amount would appear to exceed C$20 million before taxes."

MacMillan Bloedel Ltd. enjoyed record sales and earnings in the quarter. "Even though the current stock market crisis appears to be signaling economic uncertainty, nearly every sector of our business was buoyant in the quarter, and we are in an excellent position to take advantage of the opportunities that may appear in the coming months," said Ray Smith, president and CEO. He said MB's strategy of making incremental outlays to convert its facilities to higher-value products was working well. But he cautioned that the current economic climate will slow the pace of MB's decisions on capital projects. "Some of our plans might not be moving ahead as quickly as was earlier anticipated," he observed.

Abitibi-Price Inc. reported that its third-quarter earnings were up 14.6% on increased sales of 4.6%. Bernd K. Koken, chairman and CEO, said that while earnings benefited from stronger performances in newsprint, distribution, and building products operations, the lower value of the U.S. dollar, which fell from an average of C$1.3911 in 1986 to $1.3310 in 1987, had a "significant adverse effect." The Jonquiere, Que., mill also experienced some delays in making web-sized offset paper.

Domtar Inc.'s net earnings fell 7.9% to C$35 million. The company said the main factor influencing operating profit in the third quarter was the major maintenance shutdown at Lebel-sur-Quevillon, Que., pulp mill, which caused the earnings of the entire pulp division to decline. The company noted that profits from its fine paper operations declined because of higher pulp costs, but profits from newsprint and groundwood specialties improved because of strong demand.

Consolidated-Bathurst Ltd. reported third-quarter operating earnings of C$84 million, which it said is a 23% improvement over last year's third-quarter. The company said higher prices for newsprint, bleached kraft pulp, and containerboard were offset by a rise in the Canadian vs U.S. dollar and higher manufacturing costs due to increases in energy costs and a short strike at its three St. Maurice Valley mills.

British Columbia Forest Products Ltd. enjoyed record earnings during the first nine months of C$99.5 million—a 190% increase over the 1986 period. The company described pulp and newsprint markets as "extremely robust" and has committed to spending C$32 million to increase newsprint capacity at its Crofton, B.C., facility. Sales of lightweight coated paper from BCFP's Blandin Paper Co. subsidiary were "excellent and the remaining production is sold out for the rest of 1987," the company said. BCFP warned, however, that the strengthening Canadian dollar, falling housing starts, and the introduction of the new stumpage appraisal system will adversely affect the company's earnings.

Canfor reported that the C$78.4 million it earned in the first nine months were 202% higher than the year-earlier level. The company said it used the extra cash to reduce its debt and plans to increase capital spending to improve product quality and output. Although U.S. lumber markets softened in the quarter, this was offset by healthy markets for sack kraft paper and pulp.

Rolland Inc. suffered a 90% decline in third-quarter earnings from its nonintegrated operations, reflecting some softness in fine paper prices and the sharp increase in purchased pulp costs.

Paperboard Industries Corp.'s sales improved astronomically, although its earnings were down about 87% in the quarter. It's energies were focused on acquiring and integrating Belkin Inc. It expects to reap the benefits from this in coming quarters as mill efficiency improves.

West Fraser Timber Ltd. reported a 36% increase in profits during the first nine months to $36 million. The company noted that strong worldwide demand for linerboard, along with limited capacity additions, "augurs well for price improvement." However, price increases on CTMP could possibly be stalled by new capacity entering the market, the company said.

- **Jefferson Smurfit Corp.**'s third-quarter record earnings amounted to US$26 million, which represents a 234.8% increase over the year-earlier period. Sales of $282 million were up 17.8%. The company attributed the good showing to successful price hikes that were put into effect on containerboard, boxboard, solid bleached board, and newsprint.
- **Chesapeake Corp.**'s third-quarter earnings of $6.8 million were 9.9% above the year-earlier period. (This excludes an after-tax charge of $3.2 million from the sale of Plainwell Paper Co.) Sales were up 10.9% to $179 million. ■

TABLE 2: **Canadian paper industry results.**

	Third quarter 1987 (C$000)			
Companies	**Sales**	**Change 1987/86**	**Earnings[1]**	**Change 1987/86**
Abitibi-Price Corp.	C$749,800	4.6%	C$33,000[2]	14.6%
B.C. Forest	356,000	37.8	34,400	262.1
Canfor Corp.	318,800	12.1	31,100	148.8
Cascades Inc.	128,096	18.5	5,705	27.2
Consolidated Bathurst	557,517	6.6	74,441[2]	n.m.
Crestbrook Forest Industries	57,959	41.3	6,198	255.6
Crown Forest	272,200	23.0	27,100[2]	105.3
Domtar Inc.	651,000	11.3	35,000[2]	−7.9
Donohue Inc.	116,200	−6.4	8,900	7.2
Great Lakes Forest Products	192,200	20.6	26,200	197.7
MacMillan Bloedel	817,100	24.3	82,700	160.9
Noranda Paperboard	1,090,000	17.4	57,700	151.9
Industries (8/31)	120,100	488.7	155	−86.9
Repap Enterprises Inc.	221,000	16.9	17,100	144.3
Rolland Inc.	94,792	7.6	129	−90.0
Scott Paper Ltd.	74,000	8.0	4,100	15.2
West Fraser Timber	105,400	−4.5	12,300	−12.8
Total	**C$5,922,164**	**16.5%**	**C$456,228**	**95.2%**

n.m.—Not meaningful.

1. Income after taxes, from continuing operations, excluding the most significant nonrecurring items in both years.

2. **Abitibi-Price:** 1986 earnings include C$2.3-million charge for writedown of certain items. **Consolidated-Bathurst:** 1987 quarter includes the C$28.8-million pretax gain from sales of Diamond Bathurst Inc., sale of a plant in Fed. Rep. Germany, and writedown of stake in Sulbath Explorations. 1986 quarter includes C$3.03-million charge from shutdown of a plant. **Crown Forest:** 1986 quarter excludes extraordinary charge of C$10.3 million for restructuring of Crown Stores subsidiary. **Domtar:** the 1986 quarter includes C$4-million gain from tax-loss carry-forward.

FINANCE

Paper stocks battered in Wall Street panic

Worldwide stock markets collapsed in late October amid panic-driven trading on the New York Stock Exchange. The Dow Jones industrial average plummeted a record 508 points on Oct. 19.

Paper stocks were not spared from frenzied trading activity. Most shares lost 20% to 30% of their value and closed near their 52-week low. Major industry losers at the time of the crash included Scott Paper Co., down $15.75; Union Camp Corp., down $13.63; Boise Cascade Corp., down $13.00; and International Paper Co., down $12.50.

In Canada, the Toronto Stock Exchange also dropped a record 407 points on Oct. 19 followed by a 214-point drop on Oct. 20. The Toronto Exchange's index of paper and forest products companies declined 20% during the two-day period. Domtar Inc. withdrew a public stock offering of 5 million shares originally priced at C$19.25/share. Domtar's stock closed at $15. And Noranda Forest Inc. decided against proceeding with an offering of adjustable-rate convertible subordinated debentures.

Stock buybacks announced. At the outset of the market's collapse, many companies announced plans to repurchase their own depressed shares in the open market. Most companies said they thought their shares were a good investment at current levels. Paper companies that announced major buybacks or speedups of existing stock repurchase programs included Union Camp Corp., Temple-Inland Inc., Scott Paper Co., International Paper Co., Kimberly-Clark Corp., James River Corp., and Abitibi-Price Inc. Packaging Corp. of America backed out of a deal to sell its remaining recycled boxboard mills to Republic Gypsum Corp.

The losses suffered by the paper stocks may not be fully recovered by the end of the year, or even during 1988. Even before the market's collapse, a consensus of Wall Street analysts predicted that paper industry earnings would most likely peak in 1988 as the nation's economy approached the later stages of a five-year recovery cycle.

After outperforming the market in the first quarter, paper stocks have recently been lagging the S&P 500. Prior to the collapse, paper stocks were selling at 11 or 12 times projected 1988 profit, while the S&P's P/E was 16. The current P/E ratios are about 9 for paper and 13 for the S&P.

The big Wall Street sell-off, however, could dampen both consumer and capital spending, causing the next recession, which many forecasters had been predicting for 1989, to move closer. ■

TABLE 3: **Paper company stock performances during October's stock market collapse.**

U.S. (US$)	52-Week High	52-Week Low	Oct. 15 Close	Oct. 19 Close	Oct. 22 Close
Champion International Corp.	$44⅝	$28	$39¼	$29½	$27¼
Georgia Pacific	53¾	35⅝	41	28½	31
Great Northern	50½	28⅜	54¼	40¾	34⅞
International Paper Co.	57¾	34¼	46⅜	33⅞	34¾
Jefferson Smurfit Corp.	78½	9⅞	67¾	54¼	46¾
Mead Corp.	48⅝	27	41½	29¼	28⅝
Scott Paper Co.	87	59	79⅜	61	60½
Stone Container Corp.	59¾	25⅜	50½	35¾	29
Weyerhaeuser Co.	60	35⅝	49⅝	33⅞	36¾
DJIA	2,722.42	1,755.20	2,355.09	1,738.74	1,950.43
Canada (C$)					
Abitibi-Price Inc.	43	23¼	32⅞	29	26
Consolidated Bathurst	23½	12¼	20⅞	17¾	16¼
Domtar Inc.	25¾	14	18½	14½	15⅝
MacMillan Bloedel Ltd.	31⅜	12⅞	28⅝	22⅞	19⅝
TSE 300	4,118.94	3,058.70	3,674.85	3,191.38	3,107.55

Gaylord Container to proceed with public offering

Gaylord Container Corp. still plans to make an initial public offering of 4.75 million Class A common shares despite the stock market collapse, but the issuance will be "subject to market conditions," a spokesman for the company said. Prior to the stock market crash, Gaylord had announced it would put the shares on the market.

Some 2.9 million shares are being offered by the company, and the rest are being sold by certain shareholders. According to the filing, Gaylord will merge with Mid-America Packaging Inc., which is owned by the same investor group, when the offering is completed.

The stock issuance will not affect Gaylord's plans to install a 1,000-tpd linerboard machine at its Bogalusa, La., mill at a cost of about $100 million because the machine will be financed in another way, the spokesman said. So far, Gaylord has not chosen a supplier for the machine or broken ground at the mill site. The unit is still in the engineering stages, the spokesman said. He reiterated that the 1,000-tpd unit will be an incremental capacity increase and will not replace older units.

Gaylord Container was previously part of the containerboard division of Crown Zellerbach Corp. Besides the Bogalusa facility, the company has a mill in Antioch, Calif. (200,000 tpy recycled containerboard), and another one in Baltimore, Ohio (56,000 tpy recycled containerboard). In addition, Gaylord also owns 18 corrugated box plants that are located in 12 states with an annual capacity of more than 8 billion ft^2.

Gaylord was acquired from Sir James Goldsmith in November 1986 for $260 million by an investor group headed by president and chief operating officer Warren J. Hayford and chairman and CEO Marvin A. Pomerantz. These two are also officers and major shareholders in Mid-America Packaging.

Mid-America Packaging came into being when Hayford and Pomerantz bought from Weyerhaeuser Co. an unbleached kraft paper mill and related multiwall bag plant assets in Pine Bluff, Ark., early last year. That 29-year-old mill has capacity for about 315 tpd of unbleached kraft paper used in paper bags and corrugated boxes. ■

NORTH AMERICAN MECHANICAL PULPING CAPACITY CLIMBS AS DEMAND EXPLODES

New newsprint machines, increased use in other paper grades, and rapid expansion of Canadian market CTMP mills lead the way

By JOHN C.W. EVANS, Senior Editor

Total North American capacity to produce mechanical pulp is currently close to 18.5 million short tpy, of which Canada is reponsible for two thirds and the U.S. for one third. Some 17.7 million tons of this is targeted for paper and paperboard. Capacity for TMP (including CTMP) has been gradually gaining on groundwood. Present indications are that U.S. TMP capacity may for the first time exceed that of groundwood in 1988, and that this will happen in Canada no later than the following year.

No immediate change is anticipated in Canadian RMP capacity, but the long-term trend has been to convert RMP capacity to TMP. It is unusual to see an upward change in RMP capacity anywhere, and it is very surprising to see an increase of more than 100,000 tons scheduled for the U.S. in 1988.

No separate capacity data on TMP and CTMP are available for either the U.S. or Canada, and there is no indication where capacity for chemirefiner-mechanical pulp (CRMP) is "buried."

Traditionally, mechanical pulp use in North America has been mainly for newsprint. However, the explosion in U.S. demand for other "groundwood" printing grades during the past decade has resulted in substantial increases in the use of mechanical pulps for these grades in both Canada and the U.S. Another significant area of growth has been in the use of coated publication grades, particularly in the U.S.

At least five newsprint mills in North America now regularly operate without any chemical pulp in the furnish. Four of the mills are located in Canada and one is in Virginia. Four use TMP only, while the oldest mill uses a mixture of TMP and groundwood. The U.S. mill is affiliated with the Canadian mill, which was the first anywhere to run regularly on 100% mechanical pulp.

> *U.S. capacity for TMP (including CTMP) has been gradually gaining on groundwood and may for the first time exceed that of groundwood in 1988.*

GROUNDWOOD SLOWS AS TMP RISES. Current Canadian capacity for mechanical pulps used in paper and paperboard manufacture is 10,443,000 metric tpy (approximately 11.5 million short tpy), according to recent Canadian Pulp & Paper Assn. figures. Between 1985 and 1988, Canadian capacity to produce groundwood will decrease by about 5%, with current capacity at 5,550,000 metric tpy (approximately 6.1 million short tpy). Capacity for atmospheric-refined pulp (RMP) remains virtually unchanged from recent years at 416,000 metric tpy (approximately 458,500 short tpy). TMP capacity (including CTMP) is 4,477,000 metric tpy (approximately 4.9 million short tpy). Some 602,000 metric tpy (approximately 664,000 short tpy) of Canadian mechanical pulp production is available as market pulp.

The most recent American Paper Institute capacity figures show a total U.S. mechanical pulp capacity of 6,209,000 short tpy, growing to around 6,600,000 tpy by 1989. Groundwood capacity of about 3 million tpy will remain basically unchanged through 1989. TMP will reportedly increase from a current capacity of about 2 million tpy to 3 million tpy in 1989.

CTMP EXPLOSION IN CANADA. A dramatic surge in market CTMP capacity is under way in Canada (Table 1). Prior to 1985, Canada had only one market CTMP mill, Quesnel River Pulp Co., Quesnel, B.C., with a capacity of 550 short tpy.

Consolidated-Bathurst built a CTMP plant in Bathurst, N.B., for supplying pulp to its newsprint mill in England. Recently, pulp shipments to England were cut in half and expanded bleaching facilities installed, with 100,000 tpy of bleached CTMP available for marketing.

In 1986, Temcell, an affiliate of Tembec Inc., placed a market

CTMP mill with a design capacity of 110,000 tpy in operation. Cascades Inc. has acquired the idle sulfite mill of Rayonier Quebec Inc. at Port Cartier, Que., and has recently converted the output to 175,000 tpy of bleached CTMP.

This past winter, Millar Western Pulp Ltd., Edmonton, Alta., began construction of a 220,000-tpy bleached CTMP mill at Westcourt, Alta. Fibreco Export has announced plans for a 200,000-tpy bleached CTMP mill in the interior of British Columbia. Fibreco is a consortium of 38 sawmills in that area.

Quesnel River announced this spring a major expansion of its TMP plant to provide an additional 275 tpd of bleached CTMP for the market. This addition will give Quesnel River a total market pulp capacity of nearly 300,000 tpy of CTMP, definitely the world's largest, with a capacity equal to the present total of the five market CTMP mills in Sweden.

By 1989, Canadian market CTMP capacity could be well over 1 million tpy, providing that one or more of these new mills does not give up the marketing fight and install a paper machine to utilize some of the CTMP capacity. The Canadians are concerned about developing near future markets to handle this potential large increase in capacity.

The one remaining Canadian mill still producing groundwood for the market, a division of Miramichi Pulp & Paper Co., now sends one half of its 300,000-tpy output to the company's nearby new coated publication paper mill, leaving only 150,000 tpy of groundwood for sale.

The only market RMP mill in Canada, that of Finlay Forest Products (450 tpd), will withdraw its production from the market in 1989 when the company begins operation of its new onsite newsprint mill. The only two remaining market RMP mills in the world are very small units in New Zealand and Norway.

MODERATE GRINDER ADDITIONS. New North American groundwood capacity using conventional grinders is quite modest, with only one major installation (four super-grinders) starting up in Canada. Six pressurized grinders were scheduled to start up at a U.S. installation during 1987. This is the second installation to produce PGW in the U.S. (there are none producing PGW in Canada). PGW grinders are currently on order for Scotland and Japan, which will install them in 16 mills thoughout the world.

A modification in grinder design by Voith Inc. is now available in Europe. Production installations began operating in 1986. Called "thermal grinding," the design is said to control the temperature at the grinding interface by raising or lowering the stock level in the grinder pit. In other words, the amount of pulp stone immersion is controlled.

The first two mills to use this method of controlling the quality of groundwood pulp (in 1986 and 1987) used

TABLE 1: **Canadian market CTMP capacity (short tons).**

Quesnel River	200,000 tpy now operating
Consolidated-Bathurst	100,000 tpy now operating
Temcell	110,000 tpy now operating
Cascades*	200,000 tpy to start fall of 1987
Millar Western	220,000 tpy to start summer of 1988
Fibreco Export	200,000 tpy to start late 1988
Quesnel River	100,000 tpy additional capacity late 1988
Total	1,130,000 tpy

*New type of refiner will later increase output by 75,000 tpy.

Mechanical pulping terminology

Since terminology used to describe various mechanical pulping processes is sometimes confusing and inconsistent, the following discussion clarifies those terms used in this article.

Almost invariably in North America, "groundwood" is used to mean pulp produced on a pulp stone in a grinder. Groundwood (GW) or "atmospheric groundwood" (AGW) is used throughout this article to refer to conventional groundwood. If a grinder operates under pressure, the resulting pulp is called pressurized groundwood (PGW). Thermal groundwood is produced in grinders designed to control grinding zone temperature.

In North America during the 1950s, the first mechanical pulps were produced with disc refiners for use in papermaking. These disc refiners were operated atmospherically, and the pulp produced by the refiners came to be called refiner-mechanical pulp (RMP).

In the next few years, a gradual switch to pressurized refiners took place and the product was called thermomechanical pulp (TMP), because pressurization elevated the temperature in the refining zone. Subsequently, treatment of the chips with chemicals prior to refining was widely adopted. The treatment process involved impregnating the chips with sodium sulfite and refining them in a pressurized refiner. This product is then referred to as chemi-thermomechanical pulp (CTMP).

In a later process, the impregnated chips were given a light coat and then refined in an atmospheric refiner. The cooking phase made the higher temperature used in the TMP process unnecessary to obtain stronger pulp. Pulp from this process using cooked chips is frequently referred to as "chemimechanical pulp" (CMP), which is somewhat confusing since it implies that CTMP is not chemimechanical. A few authors use "chemirefiner-mechanical pulp" (CRMP), since RMP is firmly established to mean atmospheric.

CMP is used in this article to cover the various names used by innovators of this process, including "sulfonated chip mechanical pulp" (SCMP), Ultra High Yield Sulfite (UHYS), etc., and to differentiate these from CTMP.

existing Voith grinders modified for grinder pit level control. Two other mills were scheduled to install new grinders with level control in 1987; in addition, another mill will modify two grinders. As far as is known, all five mills are located in Germany. These grinders are reported to use less horsepower compared with modern grinders installed in North America. This so called "thermal pulp" is said to be stronger than conventional atmospheric groundwood. Mills outside of North America still have more apparent interest in groundwood than those on this continent.

EQUIPMENT PRODUCER DEVELOPMENTS. During the past two years, some major changes have occurred among principal suppliers of equipment for production of mechanical pulp using disc refiners. Bauer and Sprout Waldron have been combined as Sprout-Bauer under the ownership of Combustion Engineering. Sunds Defibrator Inc. has acquired the United Paper Mills of Finland, Jyhlhavaara refiner equipment and also is seeking a joint operation with Impco.

This means that there is now only one domestic manufacturer and one foreign manufacturer of refiners in the U.S. and one domestic and two foreign manufacturers in Canada.

The grinder manufacturing arena is limited to four major companies, one each in the U.S., Canada, Finland, and Germany.

Sprout-Bauer is continuing development work using extruding equipment to shred chips prior to refining. Voith's relatively new "thermal" groundwood process was discussed above.

A new type of refiner by Hymac Ltd. is being installed as an experimental line at the Cascades CTMP mill. The refiner combines two refining stages and will have two 30,000-hp motors.

Very active development work is under way by several equipment companies on new processes to efficiently bleach mechanical pulps to substantially higher brightness, notably for CTMP. Mead Corp. has a new chemimechanical pulping process for hardwoods in operation at its Escanaba, Mich., mill. This process uses two stages of chemical impregnation followed by a short cook and atmospheric refining. The chips are first shredded and then soaked in sodium hydroxide (with the excess pressed out). Next, the chips are impregnated with a sodium sulfite solution, briefly cooked at a moderate temperature, and then refined. Power consumption is moderate, and yield is said to be 85% to 90%. The pulp can be bleached with peroxide. ■

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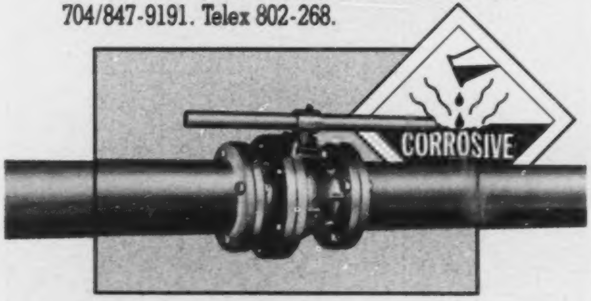

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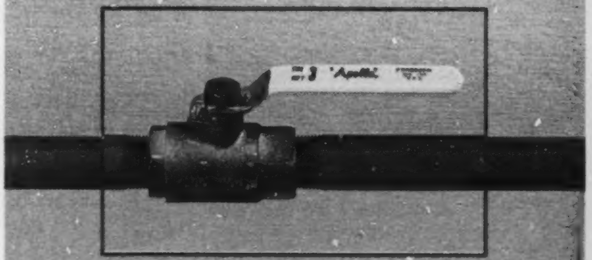

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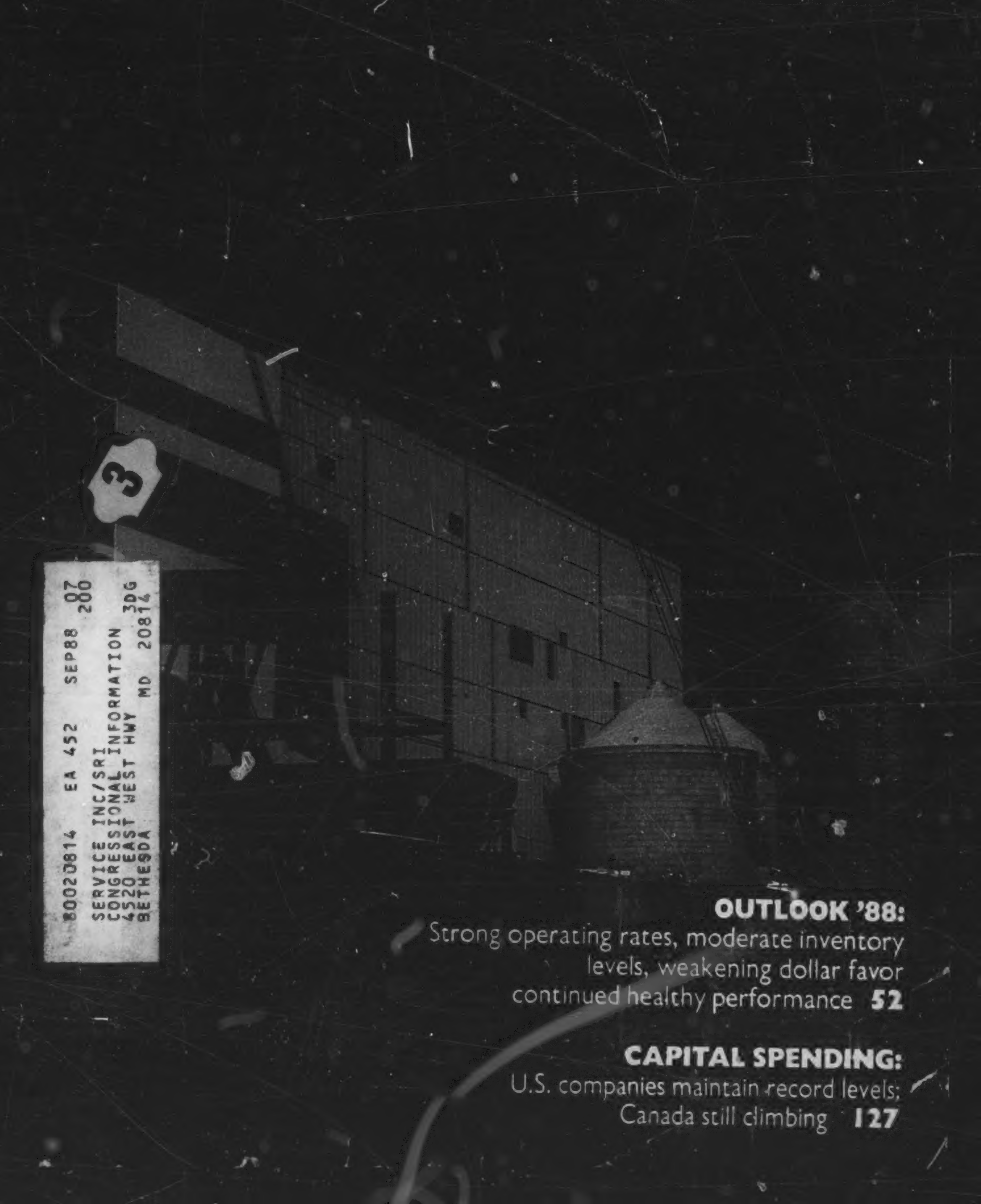
January 1988



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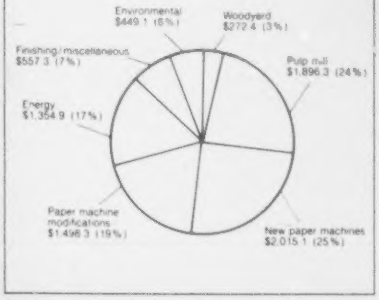

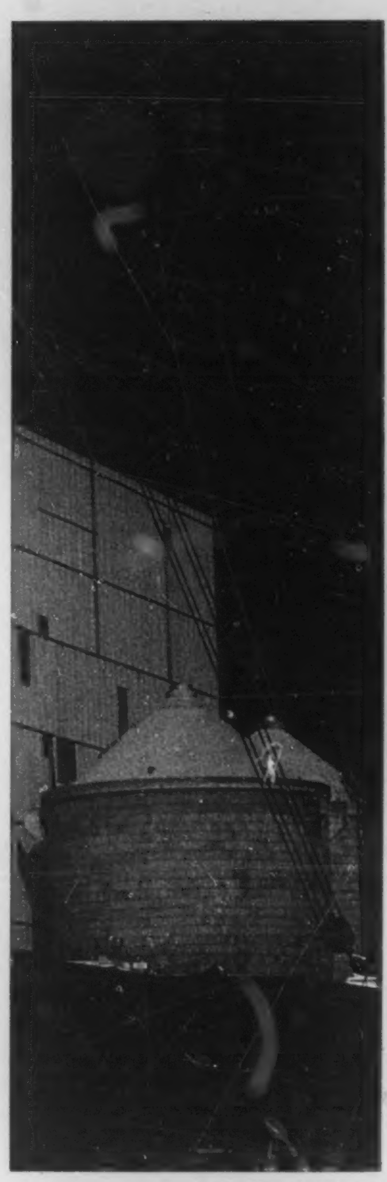

THE COVER

New Millar Western bleached CTMP market pulp mill at Whitecourt, Alta., nears completion, with startup set for this summer. Story begins on p. 80. (Photo courtesy of Castagne Communications.)

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News, Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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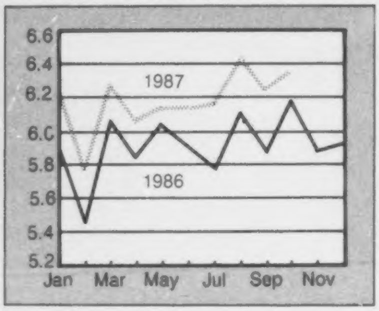


U.S. production of paper and paperboard totaled 6.3 million tons in October, up only 2.7% from the previous year, according to American Paper Institute data. The relatively modest increase reflects a change in the seasonal production pattern of some paperboard grades, including containerboard. Because of changes in labor contracts, mills took downtime for maintenance and repair in October that in previous years would have been taken in July, according to API. After adjusting for these seasonal factors, production in October was still at a record annual rate of 73.8 million tpy, up 4.8% from a year earlier.

Among major grades, communication papers continued to lead the paper sector. Printing and writing production was up 5.3% through October, led by a 9.5% increase in coated paper. Containerboard production for domestic use was up 7.6% for the first ten months, and the Fibre Box Assn. reported another record month for box shipments, up 4.4% through October.

Canadian newsprint shipments totaled 811,000 metric tons in October, down 0.6% from the previous year, the Canadian Pulp & Paper Assn. reported. Market pulp exports were also off, dropping 1.7% to 655,000 tons. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Oct.	508	8.3	5,833	3.7
Uncoated groundwood (s)	Oct.	121	-11.7	1,518	-1.2
Coated paper (s)	Oct.	588	3.2	6,810	9.5
Uncoated free sheet (s)	Oct.	962	2.4	10,931	4.7
Other printing/writing	Oct.	117	-1.7	1,380	-1.6
Total packaging and other paper (s)	Oct.	435	0.0	5,059	-1.3
Tissue	Oct.	459	1.1	5,279	3.5
Total paper	**Oct.**	**3,189**	**2.1**	**36,810**	**3.9**
Unbleached kraft paperboard	Oct.	1,566	3.6	18,863	6.9
Semichemical medium	Oct.	474	3.5	5,637	4.8
Bleached paperboard	Oct.	365	-0.8	4,414	3.2
Recycled paperboard	Oct.	755	5.0	8,577	5.5
Total paperboard	**Oct.**	**3,160**	**3.4**	**37,498**	**5.8**
Total U.S. paper and paperboard output	**Oct.**	**6,349**	**2.7**	**74,308**	**4.8**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Sept.	4,919	5.5	59,395	4.7
Market pulp production	Sept.	680	8.5	8,087	7.4
Wastepaper consumption at paper/board mills	Sept.	1,488	7.8	17,583	5.7
Pulpwood consumption (cords)	Sept.	7,856	6.7	93,865	3.3
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	Oct.	27.647	1.4	251.008[6]	4.4
Containerboard inventories at U.S. box plants and mills	Oct. 1	2,421	6.7		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Sept.	1,092	17.3	12,408	7.8
Imports of Canadian newsprint	Sept.	739	12.8	8,641[6]	4.0
U.S. paper exports (including products)	Sept.	434	11.3	5,231	15.1
Exports of unbleached kraft linerboard	Sept.	161	-15.3	2,256	10.2
Exports of woodpulp	Sept.	442	-3.3	4,888	8.1
Norscan pulp inventories[4]	Oct. 31	875	-3.0		
Norscan pulp operating rates[4]	Oct.	98%	94%	100%	98%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	Oct.	811	-0.6	8,068[6]	4.2
Operating rates	Oct.	97%	97%	97%	93%
Inventories held by U.S. consumers	Oct. 31	1,442	3.6		
Other paper/board shipments	Oct.	571	3.6	5,321	5.7
Woodpulp shipments (export only)	Oct.	655	-1.7	6,642	3.0
Operating rates	Oct.	91%	96%	95%	91%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Kraft linerboard: Favorable outlook exists even if U.S. economy slows down

Grade structure: Unbleached kraft linerboard is made in a wide range of basis weights. Standard weight in the U.S. is 42 lb/1,000 ft², but other important weights are 26 lb, 33 lb, 69 lb, and 90 lb/1,000 ft². Major use is in domestic corrugated container production, although about 13% of output is exported. Specialty grades include mottled white, solid white, and wet strength-treated board. Recycled linerboard production has grown close to 500,000 tpy, but it is not included.

Production: U.S. linerboard production rose about 6.6% to nearly 17.5 million tons in 1987, helped by strong corrugated box shipments and healthy export demand. Corrugated box shipments last year, up almost 4%, significantly outpaced U.S. industrial production.

Export shipments rose about 8% to 2.35 million tons, and they would have probably been even stronger except for supply constraints. Shipments have been strongest to Asia (particularly China), but they declined to Europe. U.S. linerboard producers ran at 99% of capacity in 1987, and activity was still strong at yearend with little sign of slowdown. Inventories of containerboard at box plants and mills on Nov. 1 dropped to 2.26 million tons—equal to 5.0 weeks of supply, an uncomfortably low level.

Capacity trends: The pace of linerboard capacity growth began to pick up in 1987 in response to the strong market conditions. According to the latest American Paper Institute survey, capacity jumped 3.1% last year. All growth is coming from incremental capacity expansion and the swing of capacity from kraft paper. Unbleached kraft paper has been under strong competitive pressure from plastic in the grocery bag and sack market, and last year total shipments declined about 7%. The API survey projects linerboard capacity will rise 2.1% in 1988, but the estimate has been adjusted to 2.8% growth in *P&P*'s forecast based on at least another 100,000 tpy of kraft paper swinging to linerboard. This would result in about 120,000 tons of additional linerboard capacity because of higher basis weights.

Only one 350,000-tpy machine has been announced by Gaylord Container Corp. for startup in 1990. Some analysts have said that a price of more than $450 is needed to justify a new linerboard mill. However, the rate of capacity expansion will probably accelerate if prices rise much higher. Profitability of U.S. linerboard mills is currently high (roughly $100/ton pretax). This reflects two years of rising prices and relatively stable variable costs for pulpwood, energy, and labor.

Future outlook: Corrugated box shipments are forecast to rise about 1.7% to a new record in 1988. This is based on a mildly pessimistic forecast of 1.2% growth in real GNP and 2.0% growth in industrial production.

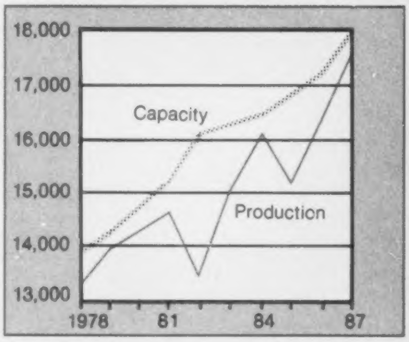
Export shipments, forecast to be up 6% to 2.5 million tons, are expected to help take up any slack that develops in domestic demand. Shipments could be higher if domestic demand weakens, since the declining dollar has given U.S. producers a strong competitive advantage in Europe and Japan.

Inventories at box plants and mills are expected to rise about 100,000 tons from their currently low level. As a result, total linerboard production is forecast to rise 2.5% to 17.9 million tons. Based on the adjusted capacity base, this would result in an operating rate of about 98%. Even if a moderate recession were to develop, operating rates would still be in the mid-90% range, which would be a relatively tight market.

Pricing: Linerboard producers are expected to try for a first-quarter domestic price increase. The move was led off in mid-December by International Paper Co., which announced a $30/ton increase to $410 for 42-lb linerboard effective Feb. 1. The increase will probably be the only one announced in 1988 and follows two $30/ton price hikes in 1987. Whether the increase holds will depend on the strength of the first-quarter domestic economy and resistance to further increases in corrugated box prices.

(Historical year-end prices for 42-lb linerboard delivered in the eastern U.S. open market are: 1987, $380; 1986, $320; 1985, $250; 1984, $350; 1983, $290; 1982, $250. For detailed price histories, see *P&P PriceBook 2*).■

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1986	1987e	1988e
Production	16,402	17,490	17,935
Capacity[1]	17,175	17,704	18,190
Utilization rate	95.5	98.7	98.5
Imports[2]	78	78	80
Exports[2]	2,177	2,360	2,500
Apparent U.S. consumption	14,303	15,208	15,515
lb/capita	118.4	124.7	116.1
GNP ratio	3.85	4.00	4.01

e = Estimate.

1. Latest American Paper Institute survey (1988 adjusted for additional capacity swing from kraft paper).
2. Dept. of Commerce.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Stone Container	2,510[1]	14.2
2. International Paper	1,665	9.4
3. Weyerhaeuser	1,420	8.0
4. Union Camp	1,270	7.2
5. GN Nekoosa	1,145[2]	6.5
6. Georgia-Pacific	1,135	6.4
7. Temple-Inland	1,120[3]	6.3
8. Jefferson Smurfit	845[4]	4.8
9. Willamette	740[5]	4.2
10. Pack. Corp. Amer.	695	3.9

Market share of top five companies:
45.2%

Market share of top ten companies:
70.9%

Total U.S. capacity (1987):
17.704 million short tons

1. Includes 49% interest in Seminole Kraft Corp. (176,000 tpy linerboard).
2. Includes Owens-Illinois Inc.'s 340,000-tpy Valdosta, Ga., mill.
3. Includes 910,000-tpy Rome, Ga., mill from dissolution of Georgia Kraft Co.
4. Includes 50% of Container Corp. of America (555,000 tpy).
5. Reflects conversion of machine and shutdown of another at Albany, Ore.

Orders for dyestuffs strong; price increase likely

Consumption. Following another positive growth year in paper and paperboard production, dyestuff suppliers enjoyed greater sales in 1987. The market expanded by 5% or more across all grades that use colorants. Figure 1 shows the breakdown of paper tonnages that were colored last year. Suppliers are predicting similar upward movement in consumption for the industry in 1988. Most believe dyestuff use along with paper production will follow the GNP (2% to 3%), barring an economic recession.

Some definite trends have evolved over the 1980s regarding dye application. Delivery and handling systems have changed, as more paper mills move away from chemical preparation systems that drain resources. Power dyes are less expensive, but many have found that liquid systems offer more flexibility. One area proven to be advantageous for liquid products is in the size-press coloring of uncoated free-sheet grades. It has been determined at some large machines that a combination of liquid cationic direct dyes added internally and liquid acid dyes applied at the size press afford high quality (brightness, uniformity) at a significant cost advantage over a system using 100% internal addition.

Quality is still a point of emphasis at mill sites. Process control devices are able to identify system problems accurately, and availability of additives must be completely open. This is another reason for liquid handling systems. Developments of alkaline papermaking have had great influence on dyestuff application, and most suppliers have responded with better, but more expensive, products. BASF Corp. has found through mill trials that benefits are evident from switching from anionic dyes to cationic dyes during an alkaline papermaking conversion. Cationics produce superior shade reproduction, clear whitewater (minimizing effluent staining), and complete dye exhaustion (when added at the fan pump).

Among paper grades, tissue and toweling products remain the largest consumers of dyestuffs. One source noted that deco inks are displacing solid colors and that in the European market, deep shades are being used in specialty tissue. A study of West Coast consumer tissue and towel products established definite trends in colored production (20% of facial, 50% of napkin, 13% of towel, and no true trend in toilet). In fine papers, approximately 10% across categories are colored. In groundwood grades, directory papers are using more dye for special consumer end uses. Newsprint is not a significant growth area, as many major newspapers already feature colored sections on sports, science, etc., and many are in decline. Colored inserts are also at a saturation level. Groundwood producers mentioned that new colored production is sometimes only available during industry downturns, as machines are then available for special orders. In board grades, school construction papers are flat because of a decreasing number of primary school enrollments.

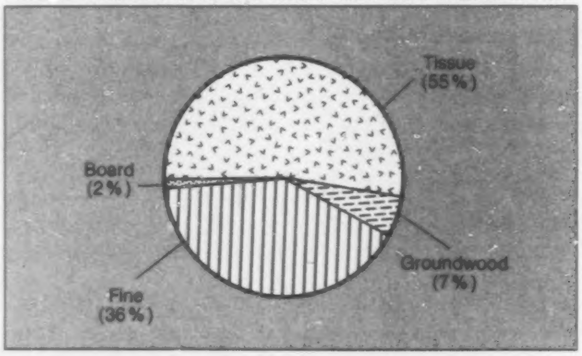
Price, availability. Profits were good for major suppliers of dyestuffs. The paper industry is second only to the textile industry in dyestuff consumption. Many companies plan product introduction within and beyond their product lines.

Crompton & Knowles Corp., the largest U.S.-based firm, operates four plants in the East. Last year's introduction of three new liquid products helped fill out the line. Several products are in the pipeline for 1988. Hilton-Davis, another domestic supplier, has decided to drop its paper business.

European chemical giants dominate the marketplace. BASF will introduce a complete range of liquid dyes for size press and calender applications (called Anthosin). Sandoz Chemical Corp. plans more cationic direct dyes, but sales emphasis will be on a new class of retention and drainage aids in 1988. Mobay Corp. will release a line of pigment dispersions offering exceptional light fastness and properties for graphic arts markets. Two cationic bleachable turquoise dyes sold last year will be added in 1988.

All suppliers commented on the high probability of price increases. Because the majority of chemical intermediaries used to manufacture dyestuffs are imported, upward price movement is inevitable. The low dollar fluctuations are causing sources to "dry up" (as one person reported), and slowdowns among U.S. formulators will result. Prices will rise at least 8% to 10% for most products. It is also believed that the glut of obsolete products hampering market expansion has now disappeared, allowing growth of the dedicated suppliers to this industry.

FIGURE 1: **Almost 1.5 million tons of fiber were colored in 1987.**



U.S. PAPER INDUSTRY SHOULD PERFORM FAIRLY WELL EVEN IF ECONOMY SLOWS

High current operating rates, moderate inventory levels, and strong cost advantage due to weak dollar are reasons for optimism

The paper industry's record production volume and operating earnings in 1987 will be followed by slightly lower achievements in 1988 as a result of a slowdown in the economy, according to financial analysts, paper company officials, and industry observers responding to *Pulp & Paper*'s annual survey.

The recent convulsions in the financial markets have already reduced consumer confidence, but lower stock prices alone are not likely to cause a recession. In fact, since World War II only about half of the severe stock market declines have been followed by recessions. In the other half, government policymakers heeded Wall Street's warnings.

At present, there are serious concerns about U.S. budget and trade deficits, the falling value of the dollar, and outright trade protectionism, but most analysts and industry people believe there is still time to change course and avert the consequences of an economic recession.

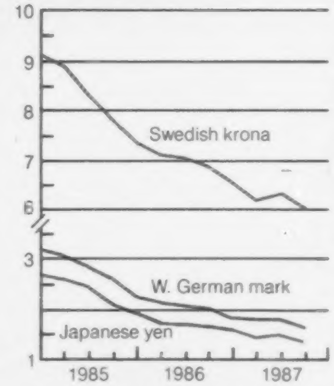
Outlook '88 was prepared by Pulp & Paper news staffers Noel DeKing in New York and Regina McGrath, Debra Garcia, Rob Galin, and Will Mies in San Francisco.

STRONG INDUSTRY. With this background, it is important to keep in perspective fundamental strengths of the paper industry compared with other basic industries in the U.S. "The paper industry is in a strong position to withstand a recession in 1988," asserts Mark Kurland of Mabon, Nugent & Co., "and it is in a stronger comparative cost position than it has ever been in the past 15 years."

Indeed, the current scenario is certainly less bleak than the situation the industry faced prior to the last economic downturn in 1982. Over the past several years, the paper industry has substantially cut its unit costs, reduced overhead, and improved productivity. The 95% operating rate reported in 1987 is also an improvement on the severe overcapacity situation which the industry experienced in the early 1980s.

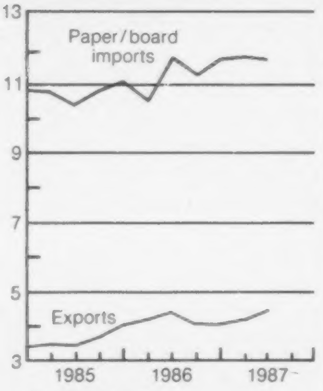
With most observers anticipating some weakness in the economy in 1988, forecasts of pulp, paper, and paperboard production are justifiably conservative. Growth in paper and paperboard production is expected to track the predicted growth in real gross national product (GNP), between 1% and 2%. This would represent a significant decline from 1986's gain of 6% and 1987's gain

The decline of the dollar against other currencies . . .



Foreign currency/dollars (yen expressed in 000s).

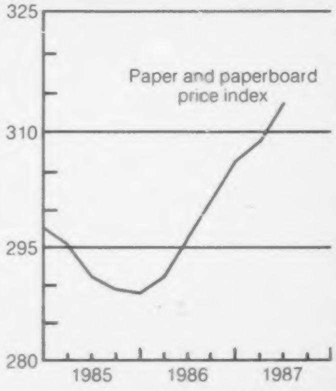
. . . boosted U.S. paper exports and slowed imports . . .



Million short tons (quarterly shipments annualized).

Source: Commerce Dept.

. . . helping to lift prices in the U.S. market.



Producer price index (1967 = 100).

Source: Bureau of Labor Statistics.

of 4%, but industry output could still reach a record 75 million tons.

On the supply side, most companies expect to proceed with the capacity expansions and capital improvement projects already planned for 1988. Some adjustments to long-term plans may come near the end of the year if the "crisis of confidence" plaguing the financial markets lingers on. "The recent erratic behavior of financial markets includes a degree of uncertainty about the outlook for the economy, but with so many economic fundamentals looking very strong, we are proceeding with the strategic plans we've put in place," says Burnell Roberts, chairman and CEO of Mead Corp.

Total industry capacity is expected to increase 2.3% in 1988, but this is likely to result in operating rates below the mid-90% level, given the more conservative outlook for production. Capacity is expected to increase 2.6% in 1989 and 2.8% in 1990. The net addition of 6.1 million tons over the next three years will bring capacity for paper and paperboard to 84.1 million tons in 1990.

Paper and paperboard prices are expected to increase in 1988, mostly due to the carryover from 1987 increases. "We expect some increases early in 1988 before a slowdown in the economy becomes evident, but by the end of the year, there could be some rollback," predicts Thomas Farrell of Deutsche Bank Capital.

Earnings are also expected to rise in 1988, even though the economic environment will turn down. For example, Roger W. Stone, chairman and chief executive of Stone Container Corp., expects his company to establish record sales and earnings in 1988 "despite the recent turmoil in the financial marketplace."

Lawrence Ross of Paine Webber points out that a positive factor for the 1988 earnings outlook is the fact that the corporate tax rate is scheduled to decline by 6% to 34%, which will be one of the lowest rates among industrialized countries. "For a company paying the 40% corporate rate in 1987, the tax rate change alone adds 10% to earnings in 1988," comments Ross.

Interest rates may be unchanged from current levels, which are down slightly as a result of an accommodative monetary policy pursued by the Federal Reserve. Many analysts expect the policy to remain intact during this election year. Despite the good news about interest rates, housing starts appear headed for a significant decline, according to David Seiders of the National Assn. of Home Builders. He predicts that nationwide housing starts this year will be just 1.45 million units, compared with about 1.64 million in 1987. "Housing demand will be adversely affected by an erosion of both household wealth and confidence in the economy, although we are not anticipating a severe short-term shock to buying plans," Seiders says.

FEWER ACQUISITIONS. The pace of mergers and acquisitions in the paper industry will subside in 1988, since most of the major restructuring in the industry has already occurred, and the time has come to pay the

TABLE 1: **Analysts' projections for 1988.**

Percentage change from 1987 levels
(unless otherwise indicated)

	Growth in real GNP	Paper/board production	Operating rates[1]		Prices	Costs per unit output[2]	Earnings		Housing starts[3]
			Paper	Paperboard			Paper	Forest products	
George Adler Smith Barney	2.5	1.9	92.9	96.6	15.0	2-3	30	20	1.53
Evadna Lynn Merrill Lynch	1.4	1.7	94.1	94.5	11.5	2.5	17	14	1.44
Mark Rogers Prudential-Bache	1.0	0.9	92.1	93.7	4.1	3.2	11	10	1.7
Lawrence Ross Paine Webber	1.8	1-2	93.0	95.0	5.0	3.0	10-15	5-10	1.4
Sherman Chao Salomon Brothers	1.5-2.5	2.0-2.5	93.0	95.0	6.0	2.0	25	(20)	1.4-1.5
William Wigder First Boston	0-1.0	1.8	92.0	96.0	3.0	3.0	15	(15) - (20)	1.45
Chad Brown Kidder Peabody	2.3	3.3	94.2	97.4	8.0	3.5	30	25	1.45
James Wei Tucker Anthony	2.0	3.0	94.0	99.0	13.0	5.0	34	20	1.5
Tom Clephane **Jeanne Carroll** Morgan Stanley	0.5	0.8	92.5	94.2	4.2	3.5	8	(25)	1.4
Average	1.6	1.9	93.1	95.7	7.8	3.1	20	5	1.48

1. Production as percent of capacity. 2. Weighted for full year. 3. Millions of units.

TABLE 2: **U.S. industry operating rates by grade.**

Paper	**Operating rates (%)** **1984**	**1985**	**1986**	**1987e**
Newsprint	94.7%	93.8%	97.0%	97.7%
Uncoated groundwood	91.8	89.0	91.4	86.9
Coated paper	95.3	88.2	92.9	92.1
Uncoated freesheet	91.0	92.2	94.4	94.3
Bristols	91.9	87.8	96.6	96.9
Thin paper	89.6	80.4	79.2	73.8
Cotton paper	81.2	77.0	79.2	82.7
Kraft & industrial	91.8	87.0	88.9	90.0
Tissue	93.3	92.4	93.1	93.2
Total paper percent	92.8%	90.5%	93.2%	93.1%
Paperboard				
Linerboard	96.8%	90.7%	95.5%	99.0%
Other	90.4	84.3	88.9	94.8
Total	96.4%	90.2%	95.0%	98.7%
Semichemical	98.4	94.0	96.7	99.8
Bleached board	96.7	90.3	93.3	94.7
Recycled	87.6	86.8	89.7	92.1
Total paperboard percent	94.6%	90.0%	93.8%	96.8%
Total paper and paperboard percent	**93.7%**	**90.2%**	**93.5%**	**95.0%**

e = Estimates.

Source: American Paper Institute.

TABLE 3: **U.S. paper/paperboard production (000 short tons).**

Paper	**1984**	**1985**	**1986**	**1987e**
Newsprint	5,539	5,428	5,630	5,803
Uncoated groundwood	1,565	1,521	1,540	1,526
Coated paper	6,249	5,875	6,263	6,784
Uncoated freesheet	9,152	9,690	10,410	10,863
Bristols	966	930	990	986
Thin paper	303	262	247	228
Cotton paper	147	144	152	162
Kraft & industrial	5,586	5,204	5,117	5,034
Tissue	4,921	4,941	5,095	5,253
Total paper	34,428	33,995	35,444	36,639
Percent change	5.0%	(1.3%)	4.3%	3.4%
Paperboard				
Linerboard	16,038	15,183	16,402	17,531
Other	1,147	1,185	1,287	1,340
Total	17,185	16,368	17,689	18,871
Semichemical	5,169	5,088	5,376	5,631
Bleached board	4,048	3,948	4,271	4,426
Recycled	7,637	7,630	8,083	8,523
Total paperboard	34,039	33,034	35,419	37,452
Percent change	5.8%	(2.9%)	7.2%	5.7%
Total paper and paperboard	68,467	67,029	70,863	74,091
Percent change from previous year	5.4%	(2.1%)	5.7%	4.6%

e = Estimates.

Source: American Paper Institute.

debts accumulated from the spending spree of recent years. "During 1987, about 40% of discretionary cash flow is being used to pay off acquisition debt, while 50% is directed toward cost-reduction projects. Only 10% is being used for new machines or mills," says Evadna S. Lynn of Merrill Lynch.

Most analysts believe that the increased concentration in the industry has been a positive development for prices and profitability, and they also believe that there will be additional consolidations in 1988. They warn, however, that the cost of future acquisitions will be substantially higher because of negative feelings toward hostile takeovers, which could change the *laissez-faire* attitude toward all mergers and acquisitions.

The rash of hostile takeovers among corporations and risk arbitrageurs in recent years created a strong backlash in the business community and prompted legislation designed to slow the trend. Federal tax provisions now apply a capital gains tax of 34% on corporate acquisitions, and a new tax proposal approved by Congress in late 1987 would disallow interest deductions on the financing used in takeovers. Equity-financed acquisitions also became more expensive following the stock market's collapse in October. This will lead to fewer and more disciplined deals in the future.

Foreign takeovers of paper companies remain attractive due to a weak dollar and lower stock prices, which have lowered the price of many American businesses to foreign buyers. "The foreigners have never had a better time than right now," says Ronald Freeman, head of mergers at Salomon Brothers.

WEAK DOLLAR. The anticipated slump in U.S. demand for paper and paperboard may be offset by diverting more production to export markets. In 1987, exports reached 14.5 million tons, an increase of 11% over 1986. The continued weakness of the dollar should be a positive factor for the major export grades of market pulp, linerboard, and bleached paperboard.

It is uncertain that U.S. producers will become price leaders in export markets since prices are traditionally set by the marginal or high-cost producer. At present, costs in Japan, Scandinavia, and Canada are higher than in the U.S. Mark Rogers of Prudential-Bache Securities describes the U.S. paper industry as "a world-dominant supplier that will become increasingly dominant over time, given the inability of our major foreign competitors to expand capacity in commodity paper products due to a lack of incrementally available woodfiber."

On the import side, Canada will account for 75% to 80% of foreign shipments to the U.S., with pulp and newsprint being the dominant grades. In 1987, imports from Canada were up 7%, but slower domestic U.S. demand in 1988 should flatten this trend.

Imports of coated printing papers from Canada, Finland, and Germany advanced strongly in 1987 due to strong demand from commercial printers. Demand for these grades will remain strong in 1988 because of the U.S. presidential election campaign, but the lower value of the U.S. dollar will make it increasingly difficult for European coated paper suppliers to maintain their market position in the U.S. Furthermore, European demand has been booming, and prices are $100/ton higher in their home markets, according to George Petty, chairman of Repap Enterprises Inc.

Most of the analysts surveyed expect the demand for newsprint and the printing/writing grades to hold up better than the demand for the packaging grades, which will be affected by weakness in demand for consumer and industrial goods. Interestingly, paperboard operating rates are expected to exceed operating rates for the paper grades because of fewer capacity additions.

"Producers should be able to obtain further price increases for newsprint, coated and uncoated papers, and bleached board during 1988," says Evadna S. Lynn of Merrill Lynch. However, a softening worldwide demand for linerboard and resistance to higher market pulp prices as world demand stabilizes could preclude further price increases for these grades.

UNCOATED FREE-SHEET

DEMAND AND SUPPLY WILL BE IN BALANCE

■ Uncoated free-sheet producers will be able to take advantage of balanced supply and demand to improve their utilization and profits, sources predict. After a slow start, uncoated free-sheet shipments last year picked up strength in the second half and were up more than 5% for all of 1987 at nearly 11 million tons.

"I'm fairly bullish," said a market analyst for a major producer. "We really don't have any new capacity coming online until late 1988. Supplies of uncoated free are tight right now and we're looking at price increases announced for January. This should be a good year for producers of uncoated free-sheet," he said.

"Printing and writing papers are our favorite category," said Ivan Crossley, an analyst with Kidder Peabody & Co Inc. Uncoated free-sheet has the closest relationship with market pulp, and the first-quarter price increase for pulp should also spur additional paper price increases, he said.

"The big question mark is the economy," said Dana Mead, vice president-white papers business at International Paper Co. "If it holds up at a reasonable level . . . we're looking at a very good, very positive supply-and-demand picture for uncoated white. Growth of demand should be in the 3% to 4% range while supply increases 2% to 2.5%," Mead explained. "This means the market is going to continue to be pretty tight." Mead predicts the tightness will last at least through the first quarter.

The market analyst for the major paper company said there will be "at least a couple of price increases in the first half '88." This is based primarily on demand, rather than the market pulp price hikes, he said.

In fact, the American Paper Institute's latest capacity survey puts growth at just 2.3% from last year. Georgia-Pacific Corp. plans a late 1988/early 1989 startup of its 290,000-tpy paper machine in Port Hudson, La. The only other possible major addition of uncoated free-sheet capacity would come from International Paper Co., which will increase its white papers capacity by 200,000 to 300,000 tpy over the next two years. Part of this additional IP capacity will come through machine rebuilds and speedups and "de-bottlenecking" production lines, said Mead of IP. In addition, a new machine could be built at the Hammermill Paper Co.'s Riverdale mill in Selma, Ala., or elsewhere.

The January price hike will bring paper prices slightly above the high levels of 1984. "We're just trying to recoup lost ground," the papermaker said. Operating rates, he said, probably will be comparable to 1987 at about 95% to 96%. Mead agrees that utilization rates will be about the same. Resource Information Systems Inc., the Lexington, Mass.-based paper/forest products forecasting firm, is predicting 93% to 94%.

The paper company analyst said industry profitability should benefit from the moderate cost increases in recently completed and soon-to-be-completed labor contracts. The benefits of the industry's capital expenditures over the last five years also will become more evident, he said. "Our industry has been spending money to streamline the papermaking process, to make it more efficient, to reduce the amount of dollars we've got tied up in a ton of paper coming off the back end of a machine. This should be a good year not only from a shipments standpoint but certainly from a profitability standpoint."

Tight markets also will allow manufacturers to continue focusing their efforts on higher-value products, such as computer papers. Some companies, most notably International Paper, will expand their commitments to alkaline papermaking. IP recently approved construction of an alkaline sizing plant at Hammermill's Erie, Pa., mill. Other producers will continue their work with twin-wire formers for more uniform paper surfaces.

COATED PAPER

WILL THE GOOD TIMES CONTINUE?

■ Predictions for a tough 1987 proved short-lived, but some industry observers are wondering if the momentum of late 1987 can be carried beyond the first quarter of 1988.

"[This] year should be pretty much a continuation of [last] year, which has been pretty tight, with everybody running essentially full most on allocation," said Jim

Gibson, industry manager of Mead Corp.'s Publishing Paper Div.

Gibson gives a caveat, however. "There are two question marks out there. One of those," he explained, "is the effect of the stock market fall and what impact that will have on retail sales, and the carry-through effect on both advertising and direct mail. If that has a substantial negative effect, it will ripple back through the paper markets.

"The second negative," Gibson continued, "is a postal rate increase scheduled for about March or April. That looks like about a 25% increase in postal costs for third class mail, and that will have some negative effect on direct mail usage."

Jeane Mayer, manager of interindustry forecasting for Wharton Econometric Forecasting Associates, said she is not predicting a recession in 1988, but "we're definitely looking for sluggish consumer spending in the first half of '88." This will be concentrated in the durable goods sector. "Consumers in general will think twice about spending on big ticket items, such as autos and furniture," she explained.

All this translates into somewhat lower corporate profits and, subsequently, less advertising, Mayer said. This means that commercial printers, who buy much of the coated papers for product brochures and the like, will see a reduced [growth] rate, from about 8.5% annualized growth in 1987 to 5% this year.

On the other hand, periodicals and books will grow at a faster pace than in 1987, and catalogs still will do extremely well, Mayer said. This will bode well for lightweight coated (LWC) papers.

The Olympics and U.S. presidential election this year also will help the coated groundwood segment, adding about 1 million tons more demand in general—most of it coated, according to Ivan Crossley, an analyst with Kidder Peabody & Co. Inc.

Crossley is not as favorably disposed to coated free-sheet market performance. "I'm not as optimistic because of the tremendous amount of new capacity coming online in the next few years," Crossley said. "It may be more than demand can support."

Coated free-sheet capacity will be about 4.8% higher in 1988 than last year. Two new machines are coming online this year, adding 205,000 tpy at Midtec Paper Inc.'s Kimberly, Wis., mill, which will start up in the fall, and an unspecified capacity addition at Potlatch Corp.'s mill in Cloquet, Minn. The new Potlatch machine (approximately 153,000 to 167,000 tpy, according to industry sources) probably will add 60,000 to 67,000 tpy to the mill. Westvaco will add 30,000 tpy at Luke, Md., completing a five-year, 150,000-tpy expansion at the mill.

No new coated groundwood machines are scheduled for startup this year, but the full effects of the paper machines brought online in late 1986 and early 1987 will be felt in the marketplace. These machines represent more than 800,000 tons of potential capacity, and they will add approximately 2.9% more capacity in 1988. In 1989, Blandin Paper Co. is expected to start up a new 254,000-tpy paper machine in Grand Rapids, Minn. A 37,000-tpy machine will be shut down at that time.

Despite the added coated free-sheet capacity, Crossley expects the coated sector to post operating rates in the 93% to 94% range.

TISSUE

CONSUMER TISSUE PRICE HIKE AT LAST?

■ 1988 is shaping up to be the year in which producers of consumer tissue will finally succeed in passing on rising pulp and wastepaper costs with an across-the-board price hike. The hike will average about 5%, observers predict Most consumer tissue prices have not been raised since 1981, although industry observers hint that tissue producers have been liberal in taking sheet count reductions.

Volume throughout 1987 remained strong, and this is expected to be the case in 1988 as well. Production through the first nine months of 1987 was running at an annual rate of 5.25 million tons, 3.8% above year-earlier levels, the American Paper Institute reports.

The API estimates that U.S. capacity for tissue paper will expand at an annual rate averaging 1.9% over the next three years to reach a total of 5.955 million tons in 1990. Last year's capacity was 5.635 million tons, according to the API. This year, Georgia-Pacific Corp., Fort Howard Corp., and James River Corp. are expected to start up new tissue machines. The G-P machine will replace an existing machine at its Palatka, Fla., mill. There are also indications that Chesapeake Corp., which owns Wisconsin Tissue Mills Inc., is planning a major tissue expansion.

PRICE HIKE IMPERATIVE. On average, toilet tissue producers have dropped sheet counts from about 460 sheets two years ago to between 320 and 330 currently, observers indicate. Analyst Jeanne Carroll of Morgan Stanley & Co. does not think producers can reduce sheet counts any further because consumers are becoming increasingly impatient with ever-shrinking rolls.

This means a price increase is the only way for producers to get any relief from rising raw material costs. Relief is much needed. The Bureau of Labor Statistics' Producer Price Index reported that prices for converted tissue inched up about 1.1% during the first nine months of 1987 compared with the year-earlier period. During the same period pulp prices were hiked twice, and a pulp price increase was pushed through in the fourth quarter as well. Higher-grade wastepaper prices tracked pulp prices throughout the year, and the price of deinking grades also jumped.

Producers of commercial and industrial (C&I) tissue implemented an across-the-board price increase averaging 5% effective November 1987. This followed a successful 6% price increase led by Fort Howard last spring.

PUSHING OFF SHORE. Scott Paper Co. and James River both announced major investment plans last year geared toward cornering the faster-growing western European tissue market. Scott will spend over $250 million during the next three years to expand its sanitary paper capacity in the region. Included in the plans are the installation of three new paper machines—one each in France, Italy, and Spain—as well as converting facilities and other equipment. Scott is also repositioning itself to take advantage of the fast-growing Asian market.

In a purchase it characterized as the "cornerstone for European expansion," James River bought 50% of the Kaysersberg Div. of French papermaker Beghin-Say for $243 million. Kaysersberg has capacity for about 128,000 metric tpy of household tissue and related products at three mills located in France.

CONTAINERBOARD

NO SIGNS OF SLOWDOWN

■ With mills still running full out in December, there was little sign of any slowdown in the containerboard sector in the wake of the mid-October stock market crash. "The current industry environment is one in which demand is pushing the limits of supply," Roger W. Stone, chairman, president, and CEO of Stone Container Corp., said recently.

Latest Fibre Box Assn. statistics showed corrugated box shipments in October were 1.4% higher than a year earlier, and analysts were expecting shipments for all of last year to be up nearly 4%. Inventories of containerboard at box plants and mills on Nov. 1 were at rock-bottom levels at around 2.26 million tons, representing 5.0 weeks of supply.

Linerboard mills continued to run at close to 100% of capacity into December, and total production for the year was expected to be up about 6.7% at 17.5 million tons. Export shipments have been picking up momentum, and for all of 1987 they probably totaled close to 2.36 million tons, up 8% from 1986.

DIFFERENT FROM 1984. "We certainly don't have any of the ingredients around this December like we had in December 1984 when the industry went into its nosedive," remarked Jerry H. Ballengee, senior vice president of Union Camp Corp. "Inventories are on the short side of being comfortable. In 1984, we had very high inventories and a strong U.S. dollar, which obviously is not the case as we go into 1988."

Union Camp has reduced its projections for U.S. corrugated container consumption in 1988 to reflect most economic forecasts, Ballangee noted. "However, we still see 1988 as a strong year with equal or perhaps slightly more consumption of corrugated than in 1987, which was a record year."

Ballangee said that linerboard export shipments in 1987 were probably constrained by available supply. With the continued weakness in the dollar, export demand will likely be strong in 1988 as long as the economies of major exporting countries remain healthy, he said.

WORST-CASE SCENARIO. Even if corrugated box shipments remain relatively flat due to a consumer-led recession, linerboard operating rates would still be in the 96% range, according to Thomas P. Clephane of Morgan Stanley & Co.

Although it might not be strong enough for mills to obtain another price increase projected for spring, this level of operation should at least be enough to support the $380/short ton price implemented last fall, he said. And profits of the major U.S. linerboard producers should be up 15% to 25% in 1988, mainly due to the carryover effect from price increases in the second half of 1987, he estimated.

It would take a severe 1% to 2% decline in real GNP to knock operating rates down to the 92% to 94% range at which prices might begin to weaken—and such a sharp decline in the economy is unlikely, said Clephane.

NO NEW MILLS. Linerboard producers were able to push through a $30/ton price increase to $350 in early 1987 and then a similar increase to $380 in early fall. Although the pace of capacity expansion has been picking up, price levels are still not high enough to justify major greenfield capacity expansion, according to Clephane. He estimates that a linerboard price of about $465/ton would be necessary to earn an 11.5% after-tax cash-flow return on total investment in a large greenfield mill plus related box plants, timberland, and working capital.

Only one new 350,000-tpy linerboard machine has been announced by Gaylord Container Corp. for startup in 1990. Most of the remaining capacity expansion will come from incremental projects and the swing of some kraft paper capacity into linerboard production. In its recently released survey, the American Paper Institute projects only a 2.1% increase in linerboard and a 1.2% increase in semichemical medium capacity this year.

CAPACITY SWINGS. With linerboard markets expected to remain tight in 1988, additional linerboard capacity could come from swing machines producing both linerboard and kraft paper. During 1987, about 850,000 tons or 25% of kraft paper was produced on linerboard machines.

The largest market for kraft papers, grocery sacks and merchandise bags, has been steadily losing market share to plastics at a rate of about 5%/year. Continued market erosion is likely in 1988, and the probable consequence of this trend is the conversion of kraft paper capacity to other grades.

When machines are converted from kraft paper to linerboard, output can be increased by a factor of about 1.2. "Applying this conversion factor to 1988, when we expect a 4% drop in kraft paper output, an additional 220,000 tons becomes available for linerboard production," noted Clephane. As a result, he estimates that linerboard capacity could grow as much as 3.3% in 1988.

BOXBOARD

WEAKER CONSUMER MARKETS AHEAD?

■ Boxboard producers will have little time to enjoy the industry's strong 1987 performance as they confront reduced demand for their products in 1988. Consumer spending is likely to decline this year, and this will adversely affect the packaging grades which have contributed to the sharp upswing in bleached, recycled, and unbleached kraft paperboard production during the past two years.

Demand for bleached board was up 4% in 1987, after advancing 8% in 1986. With this positive growth trend, the industry easily accommodated Westvaco Corp.'s new 175,000-tpy SBS machine, which started production in early 1986. Both domestic and export orders surged as total consumer spending escalated and the U.S. dollar plummeted against other currencies. Paperboard milk cartons staged a revival against plastics, while paper cups and other disposables maintained a healthy share of the huge fast-food market.

Recycled board markets were also strong in 1987, and production increased by 5%. Recycled mills producing folding carton stock reported strong orders throughout the year as the price differential between clay-coated grades and solid bleached approached $200/ton, thus prompting customers to switch to lower-cost materials. Markets for gypsum linerboard, corrugating medium, and tube and can stock were also strong as the country's industrial output and construction activity escalated.

TABLE 6: **Linerboard prices have been rising faster than corrugated box prices.**

	Eastern U.S. price 42-lb linerboard[1] ($/short ton)	Average U.S. corrugated box price[2] ($/1,000 ft^2)
1987		
4Q	$380	n.a.
3Q	350/380	$42.86
2Q	350	42.76
1Q	350	41.20
1986		
4Q	320	39.63
3Q	310/320	38.54
2Q	280/290	38.00
1Q	250/260	37.73
1985		
4Q	250	38.14
3Q	250	38.86
2Q	275	41.35
1Q	310	42.56

1. Source: *Pulp & Paper Week*. 2. Source: Fibre Box Assn. index.

Unbleached kraft boxboard production was relatively flat in 1987. Most of the kraft board produced is used in the beverage carrier market, which has received a boost in recent years from the successful marketing of wine cooler beverages. Kraft producers anticipate additional growth by diversifying into the folding carton markets dominated by bleached and recycled grades.

JANUARY PRICE INCREASES. Bleached board producers raised prices by $30/ton in April and $35/ton in October, raising the list price of 15-pt SBS in rolls to $660/ton by the end of 1987. Some mills phased in the October increases so that the new price would not be fully implemented until January 1988. Many analysts expect another attempt to raise prices during the first half of the year when market conditions are favorable.

In May, recycled board producers raised prices in the East by $30/ton for 20-pt clay-coated folding carton stock in rolls and $20/ton for bending chipboard grades. In August, midwestern mills raised prices for clay-coated stock by $25/ton, and they raised the price of chipboard by $20/ton. Generally, this brought prices of 20-pt clay-coated folding carton stock to about $390 to $430/ton and prices of 20-pt uncoated chipboard to $330/ton in the Midwest. East Coast prices were about 5% lower, but eastern mills announced price increases for January in order to remain competitive with midwestern mills. Meanwhile, West Coast mills were selling clay-coated grades for as much as $465/ton.

Prices of unbleached kraft board fall between the two competitive grades of SBS and clay-coated recycled. Coated kraft board has some inherent cost advantages because it is not bleached like SBS and it has a significant basis-weight advantage over recycled board. Mead Corp. and Manville Corp. are the only commodity producers of kraft board, and each company claims about 50% of the market.

Manville Corp. boosted its production capacity to 550,000 tpy when it completed a machine rebuild at its West Monroe, La., mill in late 1987. The company is also planning to rebuild an idle coated kraft board machine at the mill over the next three years, which will further increase its capacity. For its part, Mead Corp. will expand its coated kraft paperboard operations in Mahrt, Ala., with the construction of a new 350,000-tpy mill for a 1991 scheduled startup. Mead currently has production capacity of 420,000 tpy.

OUTLOOK IS CAUTIOUS. Demand for the boxboard grades is expected to be down slightly from 1987 levels. Copeland Economics Group forecasts a 1.5% decline in SBS production, a 3.5% decline in recycled board, and a 1.5% decline in unbleached kraft.

The folding carton market is expected to drop about 3%, milk cartons down 1.3%, cups down 1%, and plate and other food containers up 7%—following a 14% decline in 1987.

Gypsum linerboard production will be off 5% or more as a result of a severe drop in housing starts and other construction activity. A reduction in total industrial production will push production of tube, can, and drum stock down by at least 5%.

WASTEPAPER

GROWTH TREND TO CONTINUE

■ Paperstock markets are expected to continue to grow in 1988 as mill operating rates remain high—at least through the first half—and mills use more recycled fiber in paper and paperboard production. Exports should be boosted by the weak U.S. dollar, as well as the growth in such prime overseas markets as Rep. Korea and Taiwan. One detrimental factor affecting the market will be the expanded involvement of municipalities in recycling.

Mandatory and voluntary municipal recycling programs are expected to cause a glut of wastepaper in the coming years. This will particularly affect old newspapers, and it also may have a significant effect on old corrugated containers. Both are the chief postconsumer grades of recyclable paper. The disposal of office papers could also be controlled, although this has not been as well accepted as it has with the bulk grades.

Mandatory recycling appears to be spreading both in the U.S. and Canada. In the U.S., New Jersey last year implemented the nation's first statewide recycling bill, which requires residents to separate their refuse for collection. In Canada, the city of Ottawa last year joined Mississauga and Kitchener as Ontario's online cities. Toronto, which has operated a voluntary program, will start mandatory recycling shortly.

For some time, collections of recyclable materials in Europe have glutted the market there and caused prices to drop. Until the fourth quarter of last year, the European market continued to flounder. Then in October, reports indicated that the market had bottomed out and was even strengthening in some countries. OCC and high-grade prices were up in France; the U.K. market was in balance, and moderate price increases in Fed. Rep. Germany were attributed to a reduction in the collections of wastepaper. Wastepaper consumption in Italy rose slightly, resulting in some success at raising paperstock prices by 5% to 15%.

U.S. collections of recyclable paper were expected to reach an all-time high in 1987, with a projected domestic consumption level of 19 million short tons and an export level of 4.2 million tons. This year, market observers expect U.S. paperstock exports to reach 4.5 million tons or more. Though U.S. paperstock dealers will find it more difficult to keep prices up for the lower grades as municipalities bring in additional fiber (especially in the lower grades), the outlook for 1987 remains good due to projected strong demand from consumers worldwide.

HIGH RUNNING RATES. One observer indicated that U.S. mills should run well in 1988, at least for much of the year. This includes tissue mills, which use more of such grades as white and colored ledgers and coated book stock, as well as pulp substitutes. Linerboard mills should be operating at near-capacity levels, boosting demand for OCC and new double-lined kraft corrugated clippings. At the same time, the strength in pulp markets will cause pulp substitute prices to reach record levels.

One grade that may slacken off a bit is computer printout, due to the problem with deinking laser printing. Although some companies claim to have the technology to take out laser printing, mills appeared to be reluctant to trust the new technique. Perhaps in the coming year or two, these technologies will be proved. Others who have not already found ways to incorporate laser-printed CPO in their stock may do so. Some now mix the contaminated material in with other fiber and use it in inner layers of paper and board.

The trend toward increasing the portion of recycled fiber used in making paper and board, especially for such grades as corrugated medium, linerboard, and newsprint, should boost demand for paperstock in the coming years. With these three paper and board grades expected to remain in good demand in 1988, secondary fiber demand should also remain high. In addition, several companies will be building greenfield mills using secondary fiber over the next three years.

SUBS FOLLOW PULP. Most market observers do not expect the U.S. economy to turn down until sometime after mid-year, possibly not until 1989. The consensus calls for strong markets in the first half of 1988, with weakening in the second half. In the first quarter, pulp substitute prices should go up again, following another hike in woodpulp.

At the same time, OCC and DLK demand and prices should also turn around as mills that stopped buying in the fourth quarter start to rebuild inventories, particularly overseas. Old news demand will be helped by strong newsprint markets, although the biggest jump in consumption will occur in 1989 as greenfield mills get ready to start up.

Paperstock exports are expected to continue to increase due to growing demand from developing countries, especially those in the Pacific Rim. The American Paper Institute expects total U.S. exports of wastepaper in 1987 to top 1986's record 3.7 million short tons by 600,000 tons. Of this, 2.7 million tons is expected to go to such key Southeast Asian countries as Rep. Korea and Taiwan.

CANADIAN INDUSTRY

TRADE POLICY, STOCK MARKETS, AND RECESSION FEARS DAMPEN PROSPECTS

Canadian pulp and paper companies are facing more uncertainty in 1988 due to changing government policies, slower world economic growth, and major labor bargaining. Following a generally favorable climate in 1987 that saw prices and profits soar, this year is broadly being labeled a "correction period" for markets that may have risen too far and fast over the past 12 months.

As with the sharp escalation in stock prices, the profit margins for such key Canadian industry grades as newsprint and pulp skyrocketed during 1987. In 1988, however, the performances of these commodities may slow down and even stall later in the year. The risk of a recession this year has increased because of the stock market's decline in the last quarter of 1987. Yet earnings overall should be relatively good for the year, as any downturn is not expected to show up in the quarterly results until late in the year.

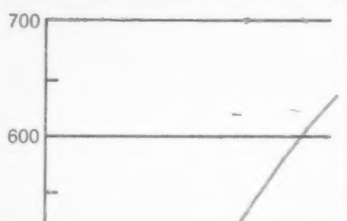
Capital spending by the Canadian pulp and paper industry is expected to be up sharply in 1988. However, the recent decline in stock prices could make financing more difficult to obtain, perhaps causing delays in some projects, according to Ross Hay-Roe, editor of *PaperTree Letter*.

Foreign investment in the Canadian pulp and paper industry will probably increase this year, with at least two Japanese companies studying major projects in western Canada. One of these, Oji Paper Co. Ltd., in late December announced it was forming a venture with Canfor Corp. to acquire and then significantly modernize and expand the latter's Port Mellon, B.C., pulp mill in a C$635-million program. Daishowa Paper Manufacturing Ltd. is also studying possible new market pulp mills for Alberta and British Columbia.

FREE TRADE AGREEMENT. The Free Trade Agreement being worked out with the U.S., Canada's largest trading partner, is not likely to have much effect on the Canadian pulp and paper industry. The two major Canadian products, newsprint and pulp, are already tariff-free into the U.S. However, protectionist sentiment in the U.S. is likely to continue putting pressure on Canadian officials to withhold any financial aid that might be considered a subsidy.

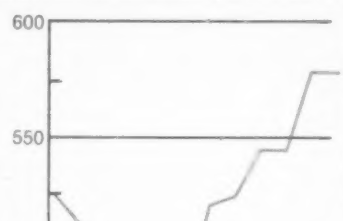
The American Paper Institute indicated recently that it would keep close watch on such mills as Domtar's in Windsor, Que. This is a fine paper mill that is being upgraded using a ten-year, $150-million interest-free loan from the federal and provincial governments.

PROTECTIONIST PRESSURES. The U.S. Congress has also been considering a trade bill that would broaden the definition of what constitutes a government subsidy to an industry, thus making a wide range of Canadian exports, including pulp and paper, vulnerable to countervailing duties. The Canadian Pulp & Paper Assn. last year began campaigning against the proposed bill, con-


The dramatic rise in market pulp prices . . .

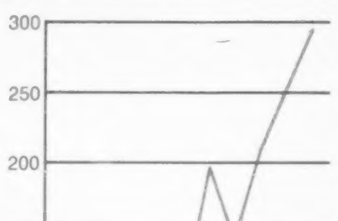
▲ Price for northern bleached kraft pulp delivered in U.S. ($/metric ton).

Source: *P & P Week.*


. . . plus firming newsprint prices . . .

▲ Estimated transaction price in eastern U.S. ($/metric ton).

Source: *P & P Week.*


. . . have lifted profits of Canadian mills.

▲ Profits of six major companies: Abitibi, BCFP, Canfor, Con-Bath, Domtar, MacBlo (C$ millions).

tacting U.S. publishers. "We are telling them this is a time bomb in Washington, and if it goes off, you're going to get bombed out as well as everybody else," said Anthony Rickards, CPPA's director of trade services. Canada supplies about 57% of the newsprint requirements in the U.S.

Canada's GNP growth in 1987 was expected to be a healthy 3.6% compared with 1986, although housing may tumble somewhat in 1988 if interest rates go up as expected. Lumber industry profits will also be impeded by changes in provincial forest policies, such as those involving stumpage and tenures, which changed in British Columbia last year in response to growing protectionist sentiment in the U.S.

Sectors of the industry other than building products should continue to perform well, however. Both newsprint and pulp prices are slated to increase in January. Supplies of these commodities are expected to remain limited through the end of the decade. In fact, shortages may occur in the interim unless the U.S. market slows down. Any shortages between the U.S. and Canada will be further constricted by demand from overseas, which has become a more lucrative market for the Canadian industry ever since the Canadian dollar's drop against overseas currencies. One forecast calls for the Canadian dollar to trade at 76 cents or better against the U.S. dollar through 1988.

Canadian producers, however, will continue to suffer loss of market share to U.S. imports if the Canadian dollar continues to strengthen in relation to the U.S. currency. Abitibi chairman Bernd Koken considered the major risk to the company in 1988 as any further decrease in the value of the U.S. dollar in relation to the Canadian dollar.

This trend has benefited U.S. producers of lumber, newsprint, and uncoated groundwood papers. The most significant opportunity, however, remains in the sale of U.S. lumber, where higher costs (labor, currency, and the 15% tariff) are forcing the Canadian producers to hold a pricing umbrella over the industry, according to First Boston analysts.

LABOR NEGOTIATIONS POSE THREAT. Labor negotiations involving most mills in British Columbia will also have an effect on industry markets and earnings this year. The two major paperworkers unions, the Canadian Paperworkers Union and the Pulp, Paper & Woodworkers of Canada, are expected to seek higher wage settlements than in past years. High profits over the past two years could put industry negotiators at a disadvantage in trying to negotiate more moderate wage increases.

Also, one major issue unresolved in the last round of bargaining is likely to cause problems. The International Woodworkers of America could again strike over the issue of contracting out, which threatens union jobs by allowing companies to hire contractors to do work now done by unionized employees.

NEWSPRINT

MORE MODEST ADVANCES IN PRICES, DEMAND

■ Market observers began in the final quarter of 1987 to modify their outlook for newsprint markets in 1988, following October's stock market crash. This seemed to mark a turnaround in the trend toward stronger newsprint markets experienced in the latter part of 1986 and 1987.

Instead of the 2% to 4% growth forecasts for 1988 made by industry analysts earlier in 1987, estimates later in the year were pared down to the lower end of the range, and even below if the U.S. economy should slide into a recession.

Most industry observers are keeping an open mind about the market falling off as early as the second half of 1988, despite such factors as the presidential election and the Olympics, which are expected to boost advertising lineage this year. In addition, markets should remain reasonably tight due to limited capacity increases in recent years. Supply is not expected to exceed consumption until 1990 at the earliest.

Prior to the fourth quarter's stock market downturn, market observers expected newsprint prices to rise as high as $750/metric ton by the first half of 1989. Now, however, the most optimistic forecast by Brian Topp of Capital Group Securities Ltd., Toronto, calls for a high of $680 by sometime in the second half of 1988. Even then, prices are likely to begin sliding in 1989 as new capacity comes online and the chance of a recession intensifies.

LONG-TERM DEALS. Already in the fourth quarter of 1987, North American newsprint producers began to court their most favorable customers with promises of large discounts for signing long-term agreements of three to five years, knowing that 1990-91 was shaping up to be a time of weakness for suppliers. If greenfield newsprint projects announced during 1987 plus incremental capacity increases are taken into account, industry output by 1990 could substantially exceed demand, especially if a recession slows growth.

According to Gary Palmero, of Oppenheimer & Co. Inc., New York, if there is no recession in 1988, the chances of a recession in 1989 are even greater. However, this could be beneficial since it might discourage other major capital investments while allowing for economic recovery in time for expansions to be absorbed. The worst case, noted Palmero, would be to have a recession in late 1989, when much of the anticipated capacity hikes are expected to come onstream.

John Carroll, of Andras Research Capital, Montreal, expects worldwide capacity to rise by 500,000 tons in 1987, by 280,000 tons in 1988, by 425,000 tons in 1989, and by 780,000 tons in 1990. In North America alone, capacity hikes of up to 1.9 million tons are forecast through 1991. However, only about 1.5 million tons of this is committed, with another 500,000 tons still tentative. Considering the instability of financial markets late in 1987, few expected these projects would be able to secure funding, however.

Newsprint capacity in Canada is expected to rise by an annual rate of less than 1% between 1986 and 1989 to 10.16 million tons, according to the Canadian Pulp & Paper Assn. In the U.S., expansions will be somewhat greater during this time. According to figures from the American Paper Institute, capacity will rise by 1.7% a year between 1986 and 1989, but it will jump by 8.8% between 1989 and 1990 when capacity reaches an estimated 6.02 million tons.

According to the European Paper Institute, European newsprint capacity will rise from 6.63 million tons in 1986 to 7.85 million tons in 1991, for a net gain of 1.23 million tons. With the total growth in demand over the five-year period projected at just 349,000 tons annually, the increase in newsprint capacity there is expected to be more than three times the rise in demand. The gap between supply and demand is expected to increase from 562,000 tpy in 1986 to 1.436 million tons in 1991.

PRICE HIKE LESS CERTAIN. The prospect of a recession in 1988 could put a damper on price advancement as early as the first quarter, when most North American newsprint companies plan to raise levels by $30 to $40/ton to $630 (minus a 5% discount) in the West and $650 (minus a weighted average discount of about 7.5%) in the East. Earlier, many industry observers felt certain this latest price hike would stick, despite two price increases amounting to $75 already implemented in 1987. The prospects for further price advancement in 1988, however, appeared less likely than previously forecast.

Many industry observers, though, expected newsprint prices and consumption would continue to rise in 1988 but at a slower and more modest rate. With Champion International Co. and Kimberly-Clark Corp. delaying price increases until Feb. 1 and Mar. 1, respectively, it appeared highly probable that many customers would not be paying the new price until later in the first quarter. In addition, newsprint suppliers were price-protecting some tons through January for customers agreeing to delay shipments until that time.

Demand remained good late in the final quarter of 1987. Mills continued to run at near-capacity levels, and customers were still being asked to delay shipments in order to meet requirements for newspapers with lower stocks. Still, some publishers were trying to build inventories in order to undermine the movement to raise prices in January.

With the U.S. dollar continuing to slide in 1987, North American imports remained at a minimum. Levels for 1987 were not expected to exceed the 300,000-ton point that they have been at for some time, and they should remain flat through 1988. However, if newsprint demand escalates higher than projected this year, limited North American supplies could force publishers into the overseas market.

Rising prices combined with limited supplies during 1988 and most of 1989 are expected to put a lid on the growth in newsprint demand through the end of the decade. Already in late 1987, publishers were considering ways to reduce newsprint consumption, such as narrowing web width and discontinuing special editions and promotions. This could also put pressure on suppliers to ease prices. More and more industry observers have started to see a turning point in the market as early as the latter half of 1988, and prices are likely to turn around by 1990.

UNCOATED GROUNDWOOD

REASONABLY GOOD DEMAND EXPECTED

■ North American producers of uncoated groundwood papers can expect to tally relatively healthy operating rates, as long as newsprint and lightweight coated (LWC) markets remain tight. The strong market is reflected in the announced across-the-board price increases scheduled for Jan. 1, 1988.

The roots of the current prosperity lie in demand that was strong and the unexpectedly strong LWC markets that overcame predictions of overcapacity as new machines failed to start up as quickly as expected.

Producers are likely to average about 94% operating rates, according to John D. Maine, vice president for printing and writing papers at Resource Information Systems Inc. Richard Kelertas, a paper and forest products analyst with McLeod Young Weir Ltd. in Toronto, Ont., put 1988 operating rates for Canadian producers at about 96% to 97%, supported by newsprint utilization rates of 98% to 99%.

Maine explained to the Third International Uncoated Groundwood Papers Conference last November that North American consumption this year probably will rise about 6.1% to about 3.3 million metric tons. Demand growth will be particularly strong this year due to tight LWC and newsprint markets, Maine said. Kelertas sees growth in Canada of about 3.5% to 4%.

GROUNDWOOD CAPACITY RISES. RISI's Maine also predicted that North American capacity will jump about 7.3% in 1988 from 1987. The American Paper Institute put the U.S. capacity increase at 6.2%. Canada's groundwood capacity should be about 10.9% higher in 1988, the Canadian Pulp & Paper Assn. reported.

In the U.S., Lake Superior Paper Industries is scheduled in 1988 to produce about 136,000 metric tons of premium supercalendered (SC) paper. The mill at Duluth, Minn., came online in November 1987. Additional tonnage will be produced at Abitibi-Price Inc.'s Kenogami Mill in Jonquière, Que., which began producing premium-grade SC last year. St. Marys Paper also is bringing additional SC capacity online in November.

SC papers are, in fact, the high-growth area for uncoated groundwoods. Maine said he expects SC demand in North America to rise 12% this year, with consumption reaching almost 1.2 million metric tons.

Kelertas said that Canada, which is the world's second largest consumer of paper per capita, also is the largest consumer of SC paper, even ahead of the U.S. and European countries. The Winter Olympics in Calgary and a domestic election, either before or after the presidential contest in the U.S., will help boost demand for SC, he said.

Unlike in the U.S., Canadian publishers and advertisers already accept SC, and there is not the grade shifting that occurs farther south, Kelertas said. "We've got a much more mature printing industry in terms of their use of these newer grades of paper, the higher-value paper," he said.

MF OUTLOOK NOT AS GOOD. Demand for machine-finished (MF) grades will decline this year because of grade switching to SC and newsprint.

North American-made SC paper will help erode the total groundwood market share held by the Europeans, who will ship almost 15% less to North America in 1988. The total uncoated groundwood imports from Europe should be about 380,000 metric tons. The European tonnage is being replaced in part by better quality paper from the SC projects at Abitibi, Lake Superior, and St. Marys.

Paper consumption by directory publishers is likely to increase 5% to about 650,000 tons this year.

Inserts and flyers will use almost 2.3 million tons, 15% more than in 1987. A strong market for uncoated groundwood paper is business forms, growing by 15% to 35% annually in recent years and expected to almost double between the mid-1980s and mid-1990s. Groundwood papers account for about 8% of all paper shipped to forms converters. Groundwood forms are used for computer printouts, generally for companies' internal sales documentation and reports.

List price differential between groundwood and free-sheet forms paper has been close to $200/ton. The Jan. 1 increase brought up groundwood forms by $50 to $60/ton, which would put 15-lb at about $650/ton. The groundwood forms hike followed a similar increase in uncoated free-sheet forms bond.

Other increases this month: MF offset, $40 to $45/ton to somewhere in the $615 to $650/ton range, depending on mill; and rotonews, up to about $610 to $645 for standard and $655 to $675/ton for premium, from the current $575 to $595 and $600 to $635, respectively.

In addition, directory papers increased $30/ton or so, pushing 22.5-lb white to about $750/ton and 22.5-lb yellow to $770. Some mills will be substantially higher than others, reaching up to somewhere near $775/ton for 20-lb, though many will be lower. At least one producer, Consolidated-Bathurst Inc., has dropped f.o.b. mill pricing and switched to delivered pricing.

K-MART DROPS U.S. PURCHASES. Some end users, most notably K-Mart, are going to Canada for both paper and printing. K-Mart, which is the second largest U.S. retailer, also buys a small but significant portion of its paper from Finnpap, the consortium of Finnish paper mills. In 1987, the discount store chain agreed to double its purchases of SC-A paper from Finnpap to 72,000 short tpy from 1988 to 1990. The chain uses more than 200,000 tons of paper annually, and most of that amount is SC-A for rotogravure.

But K-Mart also delivered some bad news for the paper industry late last year when officials announced the company would reduce its 1988 newspaper insert advertising budget by some $40 to $45 million. This means a probable 13% drop in paper purchases, or a cut of about 24,000 tons. Most of that would have been MF and SC-B grade. The money will be used instead for television advertising, other promotions, and in-store events, according to published reports. The move is part of K-Mart's attempt to appeal to a broader, more affluent consumer audience.

MARKET PULP

WILL THE GOOD TIMES CONTINUE?

■ North American market pulp producers have been enjoying boom times, thanks to the declining dollar and a favorable supply-and-demand balance.

Since the end of 1985, the price of benchmark northern bleached softwood kraft pulp in Europe has risen from $390/metric ton to $635 in the fourth quarter of 1987—a 63% increase in dollar terms. And in late November, some Canadian producers announced another $45/ton increase to $680 for the first quarter of 1988.

But even this latest increase would still not bring the dollar price up to anywhere near the fourth-quarter list price of Scandinavian mills in local European currencies. Because of the sharp decline of the dollar since mid-October, the fourth-quarter Scandinavian list price of DM1,180/metric ton in Fed. Rep. Germany, for example, was equivalent to approximately $700 to $710 by early December.

Such price levels have made market pulp extremely profitable for North American mills to produce, and they have been straining to turn out every last ton—and then some. Canadian and U.S. chemical paper-grade market pulp mills were expected to run at close to 100% of capacity for all of 1987.

Nevertheless, the recent rumblings of recession have made some market pulp industry observers wonder: Is the party almost over?

EXCHANGE RATE IMPACT. One who believes the strong market will continue through at least 1988 is William H. Vaughan, marketing vice president of Skeena Cellulose Inc., who doubts there will be a recession this year. "We believe that production and shipments will stay in the 95%- to 99%-of-capacity range, which will result in a very firm market."

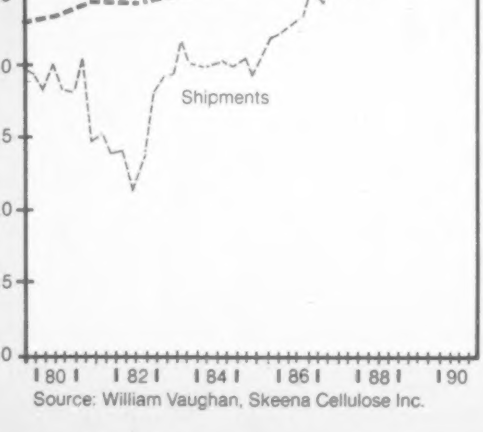
He also points out that the decline of the dollar has made it easy for the majority of market pulp producers to accept the new, higher price levels. "About 53% of demand for world market pulp is in the strong-currency countries, mainly Europe and Japan. Because of the decline in the dollar, these customers are not paying extraordinarily high prices in their own currencies." In fact, price levels are still not back to peaks reached in the early 1980s in local currency terms, he noted.

"Another 32% of world market pulp demand is in North America, where customers will be paying record prices and there could be some small effect on demand," Vaughan said. "The remaining 15% goes to countries whose currencies have not strengthened against the U.S. dollar, and these customers will be hardest hit by record pulp prices. Even if demand declines in these countries, it would not have much effect on total world demand," he added.

LIMITED CAPACITY GROWTH. While exchange rates are a major factor in the sharp runup in dollar pulp prices, a favorable underlying supply/demand balance has also helped.

World capacity of white chemical pulp is approximately 65 million metric tons, said Michael A. Poler, director of BCTMP sales for ITT Rayonier Inc. About 40% of the market is supplied by market pulp mills, while the rest is captive. "The industry, however, is doing little building of new capacity to meet expected demands," said Poler. "At an expected growth rate of 2% to 2.5% annual growth based upon the 65-million-ton figure, that should translate into 1.3 to 1.6 million tons of new chemical pulp capacity or four to five new pulp mills each with 350,000-tpy capacity, but no new chemical pulp mills are being built.

FIGURE 1: **North American and Nordic chemical paper-grade pulp shipments and capacity (millions of metric tons/quarter).**



Source: William Vaughan, Skeena Cellulose Inc.

"Part of the shortfall will be made up by bleached chemi-thermomechanical pulp," Poler said. In 1986, there was a capacity of 785,000 tons of BCTMP market pulp—280,000 tons or 36% in North America, according to Rayonier's figures. By 1989, world capacity of market BCTMP should climb to 2.4 million tons, with 1.5 million tons in North America. "So a shortfall is going to exist even with the addition of considerable BCTMP capacity," noted Poler, who will be marketing output from the Cascades (Port Cartier) Inc. mill.

TIME FOR CAUTION? Nevertheless, pulp producers should not be overconfident, since changes may be taking place in the underlying market supply/demand balance which are not yet fully apparent, said Ross Hay-Roe in the latest issue of *PaperTree Letter.* "We may be getting close to that tricky part of the cycle."

He noted that North American and Scandinavian producer inventories of chemical paper-grade market pulp may have bottomed out at the end of June at 795,000 tons. Meanwhile, consumer inventories have probably been building for two years. In the U.S. (for which statistics are available), levels are up nearly 50% since the end of 1985.

"The evident buildup in customer inventories and the incipient rise in total mill inventories would be of no concern if final demand were likely to rise," according to Hay-Roe. "But end-use markets are in ample supply, and no one's short of pulp, while a sense of economic uncertainty grows.

"We've had two years of strong and rising pulp markets. While there is already talk of the next price increase [beyond first-quarter 1988], it shouldn't surprise anyone if further price changes are limited to currency adjustments."

TABLE 5: **Price of northern bleached softwood kraft pulp in U.S. dollars and local currency equivalents.**

		(per metric ton)	
4th quarter	**U.S. dollars**	**Deutsche marks**	**Japanese yen**
1981	$545	DM1,227	Y117,580
1985	390	1,005	76,600[1]
1986	520	1,044	83,467
1987	635	1,055[3]	84,135[3]
% change 1985-87	+62.8%	+5.0%	+9.8%

1. Based on $370 price in Japan. 2. Nordic list price.
3. Based on $1=DM1.66, $1=Y132 rates in early December.

LABOR

LIGHT BARGAINING YEAR, HEAVY ISSUES

This year will be a light bargaining year for the U.S. paper industry. About 85 to 90 contracts are up for negotiation, with about a third of these coming due in the South. Most of the contract negotiations occurring in the West will take place at Canadian mills.

In 1987, the paper industry and the unions continued to clash over the issues of premium pay for Sunday and holiday work and flexible work rules. Indeed, 1987 drew to a close without any resolution to the strikes the United Paperworkers International Union has been conducting against three International Paper Co. mills since mid-1987.

The industry is not expected to back down on these issues in 1988 negotiations. Companies feel that in the face of increasing international competition from such countries as Brazil, Rep. Korea, and Taiwan, plus competition from plastic products, they cannot afford to operate without winning these concessions from unions.

"Companies' commitment to running their mills during a strike is very strong," observed Richard P. Klinzing, vice president of employee relations for the American Paper Institute. It is a matter of debate among companies right now whether this will take the form of permanent or temporary replacements. Some companies have already shown they are willing to incur the short-term costs of having to replace their entire work force rather than give in on these issues. For example, International Paper Co. and Stone Container Corp. permanently replaced striking union workers last year.

In line with the strategy of curtailing long-term costs, companies will continue to negotiate contracts that contain lump-sum payments, instead of committing to wage increases over the period of a three- or four-year contract. Klinzing observed that about two-thirds of the contracts concluded in both 1986 and 1987 contained lump-sum payments in the first year.

He said that paper companies are interested in making the labor component of their costs more stable. Consequently, more mills are negotiating three-year contracts instead of two-year contracts. API figures show that through October 1987, 50 of the 65 settlements concluded were three-year contracts, and only nine were for two years.

CURTAILED WAGE INCREASES. Wage increases were modest last year and will continue to be so in 1988. During the first ten months of 1987, the average first-year wage increase for shift workers in the pulp and paper industry was 0.4%, according to the API. This is the same figure as in 1986, and it does not include lump-sum payments. Second-year wage increases averaged 1.5%, and third-year increases amounted to 1.6%, the API reports. This compares with 2.2% and 2.5%, respectively, in 1986 contracts.

1987 was a big year for Pacific Coast bargaining, and wage increases were nonexistent in some contracts, which helped bring wages more in line with those of union members in the rest of the country. A case in point is the three-year contract Weyerhaeuser Co. concluded last year with members of the Assn. of Western Pulp & Paper Workers union at five of its mills in the Pacific Northwest. The contract froze wages but included a $650 payment in the first year and a provision for pay increases of up to 4% each year, depending on each mill's profitability.

Klinzing said contracts that contain provisions for variable pay based on mill performance, which came on the scene about five years ago, will continue to play a small part in 1988 negotiations. Since these kinds of contracts require a lot of study and experimentation, their implementation will be slow. "You're not going to all of a sudden see 50 of these kinds of agreements next year," Klinzing observed.

UNION SEEKS TO CHANGE LAW. Klinzing pointed out that this year's bargaining could be affected by the fact that the UPIU will hold elections for their top officers, including UPIU president Wayne Glenn. Should a new slate be elected, labor's bargaining agenda could change. Another unknown is whether UPIU locals will bargain collectively, as they are doing in negotiations with IP and Georgia-Pacific Corp.

Throughout 1987, the UPIU maintained that its members should not be asked to concede on issues of premium pay or work rules during a period when paper companies were earning record profits. This argument lost a lot of its force after the stock market collapse. Paper company stocks lost between 20% and 30% of their value last October. This is another reason why wage increases in 1988 will be modest.

The UPIU and other unions are lobbying Congress to limit companies' right to permanently replace striking workers. During testimony before the President's Advisory Committee on Mediation & Conciliation last year, Glenn said he felt that labor-management relationships in the paper industry were at the lowest point he had witnessed during his lifetime in the labor movement. He testified that most of the European democracies and Canada already have federal legislation that protects strikers' jobs. He said he believed collective bargaining

TABLE . **Major contracts by region on 1988 bargaining calendar of U.S. paper industry.**

Company	Mill location	Union	No. of employees	Contract expires
Southern region				
Mead	Kingsport, Tenn.	O	800	1/25
International Paper	Camden, Ark.	U,B,A,O	536	1/31
	Natchez, Miss.	U,B,A,O	856	2/29
Stone Container	Panama City, Fla.	U,B,A	527	2/29
Buckeye Cellulose	Memphis, Tenn.	O	248	3/7
Georgia-Pacific	Port Hudson, La.	U	223	6/6
Chesapeake	West Point, Va.	U	603	6/15
Champion International	Pensacola, Fla.	U,B	549	6/30
Georgia-Pacific	Crosett, Ark.	U,A	1,100	6/30
ITT Rayonier	Fernandina Bch, Fla.	U,B	376	6/30
Rock-Tenn	Chattanooga, Tenn.	U	140	6/30
Union Camp	Franklin, Va.	U,O	1,187	6/30
Westvaco	N. Charleston, S.C.	U,B,A	879	6/30
Gaylord Container	Bogalusa, La.	U,B	552	7/31
St. Joe Paper	Port St. Joe, Fla.	U,B,A	590	7/31
Stone Container	Hopewell, Va.	U	359	7/31
Temple-Eastex	Evadale, Texas	U,B	832	7/31
Mead	Lynchburg, Va.	U	415	9/16
International Paper	Vicksburg, Miss.	U,B	258	9/26
Ecusta	Pisgah Forest, N.C.	U	1,301	10/3
MacMillan Bloedel	Pine Hill, Ala.	U	410	10/4
Arkansas Kraft	Morrilton, Ark.	U	275	10/14
Jefferson Smurfit/CCA	Brewton, Ala.	U,B,A,O	495	10/15
Tennessee River	Counce, Tenn.	U,B	397	10/27
Owens-Illinois	Big Island, Va.	U	253	10/31
Jefferson Smurfit	Cedartown, Ga.	O	39	11/6
Weyerhaeuser	Valliant, Va.	U	317	11/19
International Paper	Texarkana, Texas	U,B	664	11/30
New England region				
James River	Fitchburg, Mass.	U	92	3/31
Yorktowne Paper	Gardiner, Maine	U	52	4/30
James River	Jay, Maine	U,O	187	5/31
Scott Paper	Winslow, Maine	U,B,A,O	518	5/31
Hollingsworth & Vose	East Walpole, Mass.	U,O	93	7/1
	West Groton, Mass.	U,O	115	7/1
Erving Paper Mills	Erving, Mass. Brattleboro, Vt.	U	475	7/31
Rising Paper	Housatonic, Vt.	U	144	7/31
James River	Groveton, N.H.	U	550	8/31
Monadnock Paper Mills	Bennington, N.H.	U,O	116	9/1
S.D. Warren	Skowhegan, Maine	U,B,A	475	9/30
Eastern region				
Westvaco	Tyrone, Pa.	U,B	211	2/17
Scott Paper	Fort Edward, N.Y.	U,B,O	403	4/30
Columbia	Chatham, N.Y.	U	129	5/1
International Paper	Ticonderoga, N.Y.	U	700	6/1
Georgia-Pacific	Delair, N.J.	U,O	86	6/2
Finch, Pruyn & Co.	Glens Falls, N.Y.	U,A,O	644	6/15
Tagsons Paper	Mechanicville, N.Y.	U	198	7/1
Boise Cascade (Latex)	Beaver Falls, N.Y.	U	95	9/14
Marcal Paper Mills	Elmwood Park, N.J.	U	800	9/15
Newark Boxboard	Newark, N.J.	U	53	9/15
Pope & Talbot	Ransom, Pa.	U	400	9/16
Midwest region				
Simpson Paper	Vicksburg, Mich.	O	254	1/26
Georgia-Pacific	Gary, Ind.	U	105	3/31
Mead Paper	Cincinnati, Ohio	U	143	4/20
James River	Ashland, Wis.	U	183	4/30
Port Huron Paper	Detroit, Mich.	U	200	4/30
Shawano Paper	Shawano, Wis.	U	190	5/6
Fox River Paper	Appleton, Wis.	U,O	192	5/31
Green Bay Packaging	Green Bay, Wis.	U	111	5/31
Nekoosa Papers	Nekoosa, Wis.	U,A,O	732	5/31
	Port Edwards, Wis.	U,A,O	902	5/31
Manistique Papers	Manistique, Mich.	U	146	6/15
Owens-Illinois	Tomahawk, Wis.	U,A	354	6/15
S.D. Warren	Muskegon, Wis.	U	744	6/15
Alton Packaging	Alton, Ill.	U,O	243	6/30
Appleton Papers	Combined Locks, Wis.	U	530	6/30
Fletcher Paper	Alpena, Mich.	U	157	6/30
Packaging Corp. of America	Griffith, Ind.	O	68	6/30
Flambeau Paper	Park Falls, Wis.	U	473	7/31
Mead Paper	Chillicothe, Ohio (Chillicothe mill)	U	1,360	8/1
	Chillicothe, Ohio (Chilpaco mill)	U,O	748	8/1
Middletown Paperboard	Middletown, Ohio	U	54	8/16
Weston Paper	Terre Haute, Ind.	U	134	10/21
Pacific region				
Willamette Industries	Port Hueneme, Calif.	U	64	1/15
James River	Halsey, Ore.	U,B	510	1/31 2/28
Smurfit Newsprint	Oregon City, Ore.	W	208	3/15
	Newberg, Ore.	W	274	4/1
California Paperboard	Santa Clara, Calif.	W	85	4/30
Louisiana Pacific	Samoa, Calif.	W	232	6/1
Willamette Industries	Albany, Ore.	W	317	6/1
Inland Container	Newark, Calif.	U	43	6/30
Federal Paper Board	Los Angeles, Calif.	U	86	8/1

Legend: U = United Paperworkers International Union, W = Assn. of Western Pulp & Paper Workers, A = International Assn. of Machinists & Aerospace Workers, B = International Brotherhood of Electrical Workers, O = Others.

1. Reopener possible. 2. Reopener. 3. Settled Nov. 9, 1986.

Source: American Paper Institute Employee Relations Dept.

will fail in the U.S. unless the appropriate legislation is adopted.

Julian M. Kien, a consultant to the paper industry on labor issues, observed that unions seem to be losing their clout because the workplace is becoming more democratic. He points to worker participation and representation on boards of directors and employee stock ownership programs as examples of this trend. Employees are gaining increased access to decision-making, and they have the opportunity to become partners with management instead of adversaries.

CANADIAN BARGAINING SHIFTS TO WEST. British Columbia will again be the focus for labor negotiations in the Canadian pulp and paper industry in 1988. Both labor and management indicated early on that they would take a firm stand in negotiations. Contracts are due to expire on June 30, 1988, at 19 mills in British Columbia. Eight of the mills have Canadian Paperworkers Union locals, and the rest are represented by the Pulp & Paper Workers of Canada. The two unions met twice late last year to discuss upcoming negotiations, but real bargaining is expected to occur in March.

The Pulp & Paper Industrial Relations Bureau (PPIRB), which represents management, has warned union members that they should not expect bountiful contracts this year despite the fact that the industry enjoyed healthy profits last year. Don Saunders, chairman and CEO of the PPIRB, commented, "The British Columbia forest industry has emerged from the recession of the last five years with tighter management and more productive and efficient operations, but there will be future low points in the economic cycle that the industry must prepare for now." He said the industry's main concern is to "be around and financially sound after the next low point in the economic cycle."

Contracts at most sawmills in British Columbia are also up for renegotiation this year. The International Woodworkers of America-Canada started building its strike fund last October. The C$5/month strike fund levy on almost 40,000 woodworkers in western Canada is expected to generate $200,000/month. In March, a royal commission is expected to report on the issues of contracting out work and flexible workshifts. These were the main sticking points that snarled negotiations in 1986 and led to a five-month strike at the sawmills.

PULPWOOD

CHIP SURPLUSES WILL DWINDLE

Throughout 1987, pulp mills bargained from a position of strength when it came to buying pulpwood. Supplies were either sufficient or overabundant, depending on the region. Chip surpluses at some sawmills became so large that storage was a problem. This year, pulpwood supplies will be tighter.

The American Paper Institute estimated that total pulpwood consumption in 1987 was 90.704 million cords—a 4.4% increase over 1986 levels. Consumption in 1988 is expected to grow 2.2% from 1987, amounting to 92.725 million cords, according to estimates made by the API.

TO BUY OR NOT TO BUY? In the wake of the stock market collapse, people may back off from making major purchases such as houses this year. This means sawmills will mill less lumber, causing the oversupply of woodchips to disappear. After the stock market crashed, the National Assn. of Home Builders revised its 1988 forecast for U.S. housing starts downward, from 1.55 million to 1.45 million starts. This compares with 1.8 million starts in 1986. Through October of 1987, housing starts dipped to a seasonally adjusted annual rate of 1.513 million units, the Commerce Dept. reported. This was the lowest level they had reached since April 1983.

On the other hand, interest rates have fallen, giving consumers more incentive to buy houses. Plus, they may consider investment in a house to be a safer bet than putting their money in the stock market. If this attitude wins out, chip supplies would stay healthy.

Chip supplies in the Pacific Northwest could tighten this year if housing starts slide while pulp mills in the region continue to run at high levels of capacity. Export demand for woodchips from the region is also likely to remain strong because of the declining U.S. dollar, which makes buying fiber from the U.S. more attractive for Japanese pulp and paper mills.

Chip supplies in the Northwest also could be curtailed by British Columbia's decision last October to increase stumpage fees on timber that is owned provincially. Because of this, British Columbia has asked the federal government to eliminate the 15% federal export

TABLE 4: **Pulp and paper prices rose, but raw material costs remained almost unchanged throughout most of 1987.**

	1Q	2Q	3Q
West Coast U.S. Douglas fir chips (f.o.b. export prices to Japan)	$78.40	$78.40	$76.40
Roundwood, pine[1]	41.55	42.43	41.46
Roundwood, hardwood[1]	33.40	34.10	33.73
Greenchips, pine, clean[1]	23.60	23.73	18.76
Greenchips, hardwood, clean[1]	18.52	18.76	14.05

1. Source: *Timber Mart-South.* Roundwood prices include delivery to dealer yard. Greenchip prices are f.o.b. sawmill as of third-quarter 1987.

tax on softwood lumber going to the U.S. British Columbia's increased fees will raise lumber mills' costs on both overseas and domestic shipments, unlike the federal tax. Observers thus forecast a drop in lumber exports, which would shrink chip supplies.

DROUGHT DRAINS CHIP SUPPLIES. During the second half of last year, Oregon and northern California experienced the worst forest fires they have had in 30 years. The U.S. Forest Service estimated that about 3.35 billion bd ft of timber was damaged. The USFS said that about 1.7 billion bd ft of wood can be saved from the forests that suffered the most damage. While this means that a lot of wood will be harvested quickly, to prevent insect infestations, fewer clean residual chips will be available, and most mills will not risk pulping charred wood.

The southern U.S. also experienced a drought during second-half 1987, but it did not curtail logging as much as in the Northwest. Pine pulpwood supplies in the South were adequate throughout 1987. Prices for roundwood remained relatively unchanged throughout last year, and they should be in equilibrium during the early part of this year. Mills in the South will continue to compete for hardwood since it is becoming a necessary ingredient of most mills' furnish.

REGULATORY DEVELOPMENTS

COSTLY LAWS IN THE MAKING

Several federal regulations are expected to be enacted in 1988 that will have a direct effect on the paper industry. The most important of these regulations are described below.

DIOXIN LIMITS. Last fall, the Environmental Protection Agency and the American Paper Institute released the preliminary findings of a study of five bleached kraft pulp mills. This study revealed that dioxin was present in the effluent of at least three of the mills (*P&P*, Oct., p. 33).

Later in the year, it was also revealed that a separate American Paper Institute study had discovered trace amounts of dioxin in a wide range of paper products made from bleached kraft pulp, including tissue paper, some grades of printing/writing paper, packaging paper, and paperboard.

As a result of these two findings, the EPA has begun to develop a permitting strategy for dioxin discharges from all the bleached kraft pulp mills in the U.S.—about 85 mills. A draft of the strategy reportedly encourages states to collect data from their respective bleached kraft mills, reopen the permits of these mills, and institute some controls.

The API also met with the Food & Drug Administration and the Consumer Product Safety Commission late last year to describe the product testing that had already been accomplished and coordinate further testing. Limits on dioxin in consumer products are probably farther off since the amount of dioxin found in these is minute and difficult to discern.

Separate from these two studies, the EPA released the findings of the National Dioxin Study, begun in 1983. This particular study found more dioxin than was expected in fish downstream from some paper mills. The EPA will continue to monitor the levels of dioxin in fish this year.

It seems a safe bet that some kind of limits will be imposed on dioxin in mill effluent this year. This will be a hardship for mills because currently only a handful of laboratories around the country have equipment delicate enough to detect these minute levels of dioxin, leading one to conclude that the monitoring process will be costly.

Aside from the dioxin issue, the U.S. paper industry can look forward to more stringent New Source Performance Standards for the discharge of certain chemicals, since an $18-billion amendment to the Clean Water Act was passed early last year.

CLEAN AIR ACT AMENDMENT. Late last year, the House and Senate began work on a revision of the Clean Air Act that would tighten controls on the causes of acid rain and other forms of air pollution. As reported out of the Senate Environment Committee, the bill would tightly control coal-fired boiler emissions and impose controls on automobile pollution and solid waste incinerators. The bill would also allocate $2.5 billion over the next five years to develop coal burners that would emit less pollution.

The issue of acid rain is causing a widening rift between the U.S. and Canada. It is estimated that the U.S. discharges about 24 million tons of sulfur dioxide a year. Canada estimates that about half its acid rainfall is caused by air pollution generated in the U.S. The Canadian Pulp & Paper Assn. is calling for further study to find out if acid rain is the cause of dieback in Canada's forests. The Canadian government is expected to release a report shortly that indicates growth rates for white spruce have declined significantly in the past 20 years. ■

U.S. PAPER INDUSTRY CAPACITY GROWTH PICKING UP—2.5%/YEAR OVER 1988-90

In 1987, capacity jumped 2.2 million tons—the largest gain in 14 years, latest American Paper Institute capacity survey finds

By NOEL DEKING, News Editor

The U.S. paper industry will increase manufacturing capacity by 6.1 million short tons during 1988-90 for a 2.5% average annual advance, according to the American Paper Institute's latest annual capacity survey. This three-year total represents the most new capacity since 7.6 million tons were added during 1966-68 and follows 1987's 3% gain of 2.2 million tons, which is the highest single-year gain in 14 years.

The survey reflects the industry's current prosperity, as paper and board production is approaching 74 million tons for the year, a 4.4% gain over 1986, and sales are nearing $86 billion, 15% above the 1986 high. "This strong demand for paper and paperboard, largely in newsprint, printing and writing papers, and unbleached kraft linerboard, has encouraged producers to expand capacity at a higher rate than planned in 1986," said API's president, Red Cavaney. Indeed, the figures are well above the 1.8% annual expansion predicted in 1986.

Cavaney also noted that since the stock market's Oct. 19 plunge, investment plans have not changed and "there is no evidence, as yet, of any major buildup of inventories at either paper mills and plants or at customer levels." He said that the industry's 1987 operating rate should turn out to be about 95%.

Because of what may happen to the economy this year, paper companies have already hedged their short-term investment plans. For 1988, capacity will increase a modest 2.3%, as compared to 1987's 3% increment. Substantial capacity increases are scheduled for 1989-90, particularly in linerboard and newsprint, but these long-term investment plans may change, depending on the economy's performance.

PRINTING/WRITING GRADES STRONG. Paper capacity is expected to rise 2.8% annually during 1988-90, while paperboard capacity will increase 2.3% annually. The printing and writing grades, notably coated papers and uncoated free-sheet papers, will account for 2.2 million tons, or 66%, of the three-year paper capacity increase.

Uncoated free-sheet capacity will rise by more than 1 million tons, with two new paper machines scheduled to start up in 1988 and 1989, according to API. Nevertheless, the expansion rate over the next three years of 2.9%/year will be down from the 4.4% average rate of increase over the past ten years.

Coated groundwood papers, at 4.13 million tons in 1987, was 192,000 tons below last year's survey estimate. This was the result of capacity swings to other grades and delayed or reduced expansion plans. Capacity will increase at a nearly 3.0% rate over 1988-90, including one new 200,000-tpy machine which will replace some existing capacity. However, the coated free-sheet paper

TABLE 1: **Growth trends in U.S. capacity (000 short tons).**

Grades	Additions ten year increase	1978-87 average annual growth	Additions three year increase	1988-90 average annual growth
Total paper and paperboard	**16,017**	**2.3%**	**6,083**	**2.5%**
Total paper	**9,505**	**2.8**	**3,351**	**2.8**
Newsprint	1,872	3.9	695	3.8
Printing and writing	7,193	4.0	2,225	3.2
Packaging and industrial converting	(650)	(1.1)	110	0.7
Tissue	1,090	2.2	320	1.9
Total paperboard	**6,512**	**1.8**	**2,732**	**2.3**
Unbleached kraft	4,324	2.6	1,971	3.3
Solid bleached	655	1.5	191	1.3
Semichemical	980	1.9	293	1.7
Recycled	553	0.6	277	1.0
Construction grades	**(2,327)**	**(7.1)**	**—**	**—**
Total woodpulp[1]	**10,904**	**2.0**	**3,584**	**1.9**
Dissolving and special alpha	(266)	(1.7)	14	0.3
Sulfite	(636)	(3.3)	(44)	(0.9)
Sulfate and soda	9,865	2.4	2,812	2.0
Semichemical	113	0.2	119	0.9
Mechanical	1,829	3.5	692	3.5
Woodpulp for construction paper and board	**(1,038)**	**(7.4)**		

1. Excludes construction grades.
Source: American Paper Institute.

capacity estimates have been raised, and growth is now expected to average 6.2%/year over the 1988-90 period. Two new machines are planned, both replacing some existing capacity.

Newsprint capacity increased only 2.8% in the U.S. over the past four years, as producers upgraded existing twin-wire machines to improve quality. However, capacity is expected to jump by almost 12% over the next three years, mainly due to two new greenfield mills and a large new paper machine.

Tissue paper capacity is expected to rise at a 1.9% average annual rate over the next three years and includes the startup of two new paper machines. Unbleached kraft packaging papers capacity declined about 500,000 tons over the last four years, and further reductions of more than 200,000 tons are reported for 1987 mainly due to a machine conversion, according to API.

UNBLEACHED KRAFT PICKS UP. In the paperboard grades, unbleached kraft will show the largest gain, adding nearly 2 million tons for a 3.3% average annual growth rate during the next three years. A major portion of this increase, however, is in the folding boxboard category, which includes the addition of a new 420,000-tpy machine. Folding boxboard capacity is expected to jump nearly 49% over the next three years.

TABLE 2: **Paper/board annual capacity, 1987-90 practical maximum basis (000 short tons).**

	1987	1988	1989	1990[1]
Total paper and paperboard[2]	**78,021**	**79,799**	**81,847**	**84,104**
Total paper	**39,336**	**40,278**	**41,437**	**42,687**
Newsprint	5,941	6,013	6,099	6,636
Printing writing and related	22,168	22,832	23,727	24,393
Uncoated groundwood	1,756	1,865	1,882	1,917
Coated groundwood	4,132	4,215	4,344	4,509
Coated free-sheet	3,237	3,393	3,767	3,880
Uncoated free-sheet	11,520	11,780	12,190	12,543
Cotton fiber	196	197	198	199
Thin papers	309	309	309	309
Solid bleached bristols	1,018	1,038	1,037	1,036
Packaging and industrial converting	5,592	5,662	5,687	5,702
Unbleached kraft	3,370	3,416	3,430	3,438
Bleached packaging and industrial converting	531	530	530	530
Special packaging	570	570	569	568
Special industrial	1,122	1,147	1,158	1,167
Tissue	5,635	5,771	5,924	5,955
Total paperboard	**38,685**	**39,521**	**40,410**	**41,417**
Unbleached kraft	19,117	19,596	20,193	21,088
Kraft linerboard	17,704	18,071	18,633	19,195
Solid bleached	4,675	4,768	4,854	4,866
Semichemical	5,641	5,711	5,863	5,934
Recycled	9,252	9,446	9,500	9,529
Total construction paper and board	**2,128**	**2,128**	**2,128**	**2,128**

1. Represents only currently known commitments.
2. Excludes construction grades.
Source: American Paper Institute.

Linerboard capacity, however, is expected to grow at a more moderate 2.7%/year average annual rate over the 1988-90 period. This includes a new 350,000-tpy machine and 14 individual linerboard expansions of 50,000 annual tons or greater.

Semichemical medium capacity is expected to grow at a moderate 1.7%/year rate, and no new machines are planned. Bleached paperboard will add 191,000 tons, or 1.3%/year. Recycled paperboard will show a gain of 277,000 tons, or 1.0% annually, mostly in the containerboard and folding grades.

MARKET PULP EXPANSION LAGS. Woodpulp capacity will increase more slowly than paper and paperboard. Total woodpulp capacity will increase 3.6 million tons, or 1.9% annually, over the next three years, to reach 65.3 million tons by 1990. The market pulp share of this total will increase 280,000 tons, or 1.1% annually, to 8.4 million tons by 1990. Interestingly, the 1987 market pulp total of 8.1 million tons is more than 400,000 tons higher than producers' estimates in the 1986 survey.

Recyclable paper will increase its share of the industry's fiber consumption by nearly 1% to 21.5 million tons in 1990. This share increase for recyclable paper, mostly corrugated waste in the manufacture of unbleached kraft linerboard, combined with a greater use of pulp manufactured onsite and increased pulp imports from Canada, will balance the industry's furnish needs over the next three years.

FRUITS OF INVESTMENT. During the six-year period between 1985 and 1990, the industry will have added 12.7 million tons of additional capacity. New machines will provide 35% of all new capacity, with 11% coming from machines in new greenfield mills and 24% from machines installed in existing mills. Machine rebuilds and other productivity improvements will account for 54% of the new capacity growth. ■

TABLE 3: **U.S. market woodpulp capacity, 1987-90 practical maximum basis (000 short tons).**

	1987	1988	1989	1990[1]
Total market woodpulp	**8,165**	**8,400**	**8,454**	**8,444**
Dissolving	1,376	1,390	1,391	1,391
Chemical paper grades	6,776	6,996	7,049	7,040
Sulfite paper grades	285	285	285	285
Sulfate and soda paper grades	6,491	6,711	6,764	6,755
Bleached and semi-bleached softwood	3,743	3,842	3,869	3,890
Bleached and semi-bleached hardwood	2,563	2,681	2,708	2,677
Unbleached	185	188	188	188
All other	14	14	14	14

1. Represents only currently known commitments.
Source: American Paper Institute.

CAPITAL SPENDING SURVEY: 1987-89

Record earnings and big capacity expansion plans fuel big boom in capital spending; no fallout—yet—from stock market crash

By CARL ESPE, News Editor

Pulp and paper companies in both the U.S. and Canada are planning big increases in capital spending, according to *Pulp & Paper*'s annual survey of investment plans, and weakness in the financial markets is unlikely to change the picture unless it spreads to the general economy. On both sides of the border, record earnings and foreign funds attracted by weak domestic currencies will help fund strong growth in spending, according to current plans. New paper machines and pulp mill expansions claim the largest share of planned outlays, reflecting above-average capacity growth plans in both the U.S. and Canada.

The Oct. 19 stock market crash has added a note of uncertainty to the outlook, but capital spending programs won't be affected unless or until the weakness spreads to the economy, companies indicate. Pulp and papermakers have their eyes glued firmly on their businesses, and so far they like what they see: strong demand and higher prices have led to record earnings at many firms, and 1987 ended with operating rates high and inventory at moderate levels. Analysts predict that production will match the slower 1% to 2% growth rate of GNP this year, down from 4% last year, but operating rates should remain strong, and the weak dollar puts producers in a strong low-cost position.

Capital investment in the paper industry is closely tied to profits, and analysts surveyed by *Pulp & Paper* expect, on average, that profits will rise another 20% this year. While the outlook could certainly change, companies appear willing to wait for plainer signs of a downturn before they change their current plans.

P&P's latest investment survey, conducted mostly in November, covers spending plans for the three-year period from 1987 through 1989, as well as longer-range plans. Reported outlays for the period total $8.04 billion in the U.S., up 19.4% from last year's survey. In Canada, companies report plans to spend $6.67 billion for the 1987-89 period, an increase of 47.7% over last year. In both the U.S. and Canada, longer-range investment plans for 1990-92 account for about 24% of these spending totals. The most important single year is 1989 in both countries: about 32% of total reported spending in the U.S., and 39% in Canada, is for projects scheduled to start up in 1989.

Spending forecast for 1988. According to a new survey by Data Resources Inc., capital spending in the U.S. pulp and paper industry will climb to a record $11.58 billion this year—a whopping 24.7% increase over projected 1987 spending of $9.29 billion, which itself is up 5.9% from 1986. A 25% increase would be the largest since 1979, when high inflation helped push spending up 39% over the previous year.

Looking beyond 1988, preliminary plans indicate that spending will fall back to $10.6 billion in 1989, DRI reported. That would be down 8.5% from 1988 but still

TEN-YEAR CAPITAL SPENDING TRENDS ($000)

	U.S. TOTAL		CANADA TOTAL	
1987e	$8,870	1.1%	C$2,532	5.2%
1986	8,770	2.1	2,407	27.4
1985	8,590	19.1	1,890	61.0
1984	7,210	21.8	1,174	17.5
1983	5,920	−0.8	999	−29.6
1982	5,970	−11.2	1,420	−15.3
1981	6,720	−1.2	1,676	61.0
1980	6,800	22.5	1,041	52.0
1979	5,550	39.1	685	33.5
1978	3,990	10.8	513	−1.6

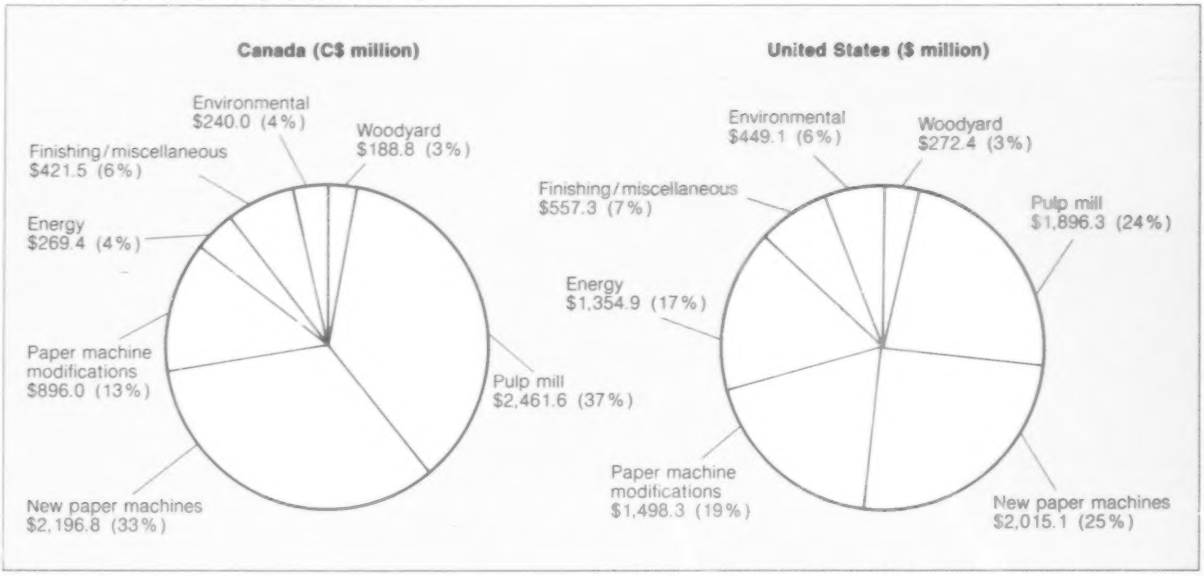
Source: Commerce Dept., Statistics Canada.

TEN-YEAR U.S. ENVIRONMENTAL SPENDING TRENDS ($000)

	AIR		WATER		SOLID WASTE	
1987e	$120	10.1%	$105	31.3%	$93	93.8%
1986	109	−37.7	80	−33.9	48	4.3
1985	175	34.6	121	95.2	46	35.3
1984	130	−12.8	62	−47.5	34	−43.3
1983	149	−30.4	118	45.7	60	160.9
1982	214	78.3	81	−11.0	23	−53.1
1981	120	−36.8	91	−35.0	49	28.9
1980	190	20.3	140	−21.3	38	65.2
1979	158	6.0	178	−2.2	23	−28.1
1978	149	0.7	182	−34.5	32	88.2

Source: National Council of the Paper Industry for Air & Stream Improvement.

FIGURE 1: **Reported spending by type of facility, 1987-89 +.**



U.S.—REPORTED CAPITAL EXPENDITURES FOR 1987-89 + BY REGION AND TYPE OF FACILITY ($000)

PRODUCTION-RELATED EXPENDITURES

	WOOD/FIBER		PULPING		NEW MACHINES		MACHINE MOD.		ENERGY		MISC./PLANT	
New England	$ —	0%	$ 230,700	12%	$ 10,000	0%	$ 310,300	21%	$ 356,700	26%	$ 23,430	4%
Mid-Atlantic	275	0%	25,930	1%	5,000	0%	46,937	3%	80,323	6%	17,830	3%
East North Central	—	0%	75,855	4%	268,000	13%	461,405	31%	79,650	6%	119,886	22%
West North Central	30,000	11%	196,400	10%	440,100	22%	—	0%	62,000	5%	96,000	17%
South Atlantic	25,975	10%	613,755	32%	500,000	25%	414,985	28%	597,700	44%	207,097	37%
East South Central	179,400	66%	244,300	13%	303,000	15%	121,700	8%	141,000	10%	36,800	7%
West South Central	9,750	4%	241,200	13%	285,000	14%	46,000	3%	—	0%	18,780	3%
Mountain/Pacific	27,000	10%	268,194	14%	204,000	10%	96,981	6%	37,550	3%	37,449	7%
Total	**$272,400**		**$1,896,334**		**$2,015,100**		**$1,498,308**		**$ 1,354,923**		**$ 557,272**	

ENVIRONMENTAL QUALITY SPENDING / TOTALS

	WATER		AIR		SOLID WASTE		PRODUCTION		ENVIRONMENTAL		GRAND TOTAL	
New England	$ --	0%	$ —	0%	$ 5,400	10%	$ 931,130	12%	$ 5,400	1%	$ 936,530	12%
Mid-Atlantic	4,900	2%	—	0%	500	1%	176,295	2%	5,400	1%	181,695	2%
East North Central	5,460	3%	7,860	4%	5,400	10%	1,004,796	13%	18,720	4%	1,023,516	13%
West North Central	18,035	9%	15,000	8%	4,500	8%	824,500	11%	37,535	8%	862,035	11%
South Atlantic	84,750	41%	65,000	34%	16,850	32%	2,359,512	31%	166,600	37%	2,526,112	31%
East South Central	55,750	27%	68,600	36%	15,000	28%	1,026,200	14%	139,350	31%	1,165,550	14%
West South Central	850	0%	11,200	6%	—	0%	600,730	8%	12,050	3%	612,780	8%
Mountain/Pacific	34,770	17%	23,800	12%	5,450	10%	671,174	9%	64,020	14%	735,194	9%
Total	**$204,515**		**$191,460**		**$53,100**		**$7,594,337**		**$449,075**		**$8,043,412**	

States are assigned to regions as follows:

New England: Maine, Vt., N.H., Conn., R.I., Mass.
Mid-Atlantic: N.Y., N.J., Pa.
East North Central: Wis., Mich., Ill., Ind., Ohio
West North Central: N.Dak., S.Dak., Nebr., Kans., Minn., Iowa, Mo.
South Atlantic: Del., Md., W.Va., Va., N.C., S.C., Ga., Fla.
East South Central: Ky., Tenn., Miss., Ala.
West South Central: Okla., Texas, Ark., La.
Mountain/Pacific: Wash., Ore., Calif., Alaska, Idaho, Nev., Mont., Wyo., Utah, Ariz., Colo., N.Mex.

significantly higher than current spending levels.

Survey results reflect the bullish trend in capital spending that has been evident since last winter. A year ago, the DRI survey forecast that capital spending would total only $5.97 billion in 1987 and that 1988 spending would climb just slightly higher, to $6.09 billion. Both estimates climbed steadily all last year, as paper companies posted big earnings gains and business strengthened in most sectors of the industry. DRI's new estimate of $9.29 billion for 1987 is up 1.9% from its previous estimate of $9.12 billion, made in May.

Spending up again in Canada. After suffering steeper declines in 1982 and 1983 than did their U.S. counterparts, Canadian pulp and paper manufacturers have been more aggressive over the past three years in raising capital expenditures. The latest survey of investment intentions, conducted early last summer by Statistics Canada, showed plans to spend a record C$2.53 billion on capital improvements in 1987, up 34.0% from 1986. As in the U.S., the C$2.53 billion spending mark reflects an upward revision from earlier estimates of about 5%. Construction spending was estimated at $360 million for the year, up 54.6% from 1986, while spending for machinery and equipment totaled $2.17 billion, up 31.2%.

In percentage terms, British Columbia posted the largest gains. Spending in the province was expected to climb 153% in 1987, to C$496 million. Companies planned to spend $1.15 billion in Quebec, up 12.8% from the previous year, and $416 million in Ontario, 25.3% more than in 1986.

ABOUT *P&P'S* ANNUAL SURVEY. Now in its twenty-fourth year, *P&P*'s annual capital spending survey covers expansion and modernization programs at U.S. and Canadian mills. Unlike surveys which track spending by year, the *P&P* survey covers spending by project. Dollar figures represent the total cost of reported projects and may sometimes includes supporting equipment. The total cost of multiyear projects is assigned to the startup year and is not divided among the years of expenditure. Each survey primarily covers a three-year period—the current survey covers 1987-89—but projects with firm startup dates beyond that time frame are also included.

*Complete results of P&P's exclusive survey of North American capital spending programs for 1987-89 are available in a separate **Mill-by-Mill Listings** report. Organized by company, the listings show programs for new mills and machines, rebuilds and modernizations, environmental quality control, and other mill improvements, with specifics on equipment ordered, dates, suppliers, and prices, where available. Subscribers to P&P's monthly newsletter, Project Report, receive a free copy of the report with their January issue. All others may obtain a copy of the report for US$105. To order, send payment to Pulp & Paper, Editorial Dept., 500 Howard St., San Francisco, Calif. 94105.*

UNITED STATES

SPENDING REBOUNDS THANKS TO RECORD EARNINGS AFTER A LACKLUSTER YEAR IN 1986

■ U.S. pulp and paper companies responding to *P&P*'s survey report plans to spend $8.0 billion on capital modernization and expansion projects during the 1987-89 period. That figure is up over 19% from the total reported last year, when a revolutionary new tax bill and uncertain business prospects depressed the capital spending outlook. Despite the recent stock market crash, papermakers remain bullish about capital spending. The main factors in the investment upswing are record earnings at many companies, prospects for continued strong demand, and further competitive advantage from the weak U.S. dollar.

Announced production-related spending totals $7.6 billion in the current survey, up 19% from last year. The largest gain is in pulp mill spending, followed by paper machine rebuild, energy, and woodyard spending. Production spending accounts for 94% of total reported outlays, compared with 95% in last year's survey. Environmental spending is up 29% in the new survey to $449

TOP SPENDERS IN U.S.

Companies which have reported capital spending plans of $100,000,000 or more, including both production and environmental programs

	1987-89	1986-88
Blandin Paper	$344,000,000	n.a.
Boise Cascade*	$257,500,000	$195,000,000
Champion International	308,900,000	389,100,000
Consolidated Papers	169,600,000	271,900,000
Federal Paper Board	193,000,000	266,000,000
Fort Howard Paper*	900,000,000	900,000,000
Gaylord Container	100,000,000	n.a.
Georgia-Pacific	433,000,000	270,000,000
GLFP/Ponderay Newsprint	300,000,000	n.a.
Great Northern Nekoosa*	357,680,000	232,880,000
James River	194,800,000	240,000,000
Mead*	542,000,000	107,000,000
Midtec Paper	261,000,000	19,810,000
Newsprint South	320,000,000	n.a.
Pentair	657,600,000	637,500,000
Potlatch	197,500,000	178,000,000
Scott Paper	191,000,000	331,000,000
Southeast Paper Mfg.	300,000,000	n.a.
Stone Container	143,848,000	150,141,000
Temple-Inland	259,425,000	n.a.
Union Camp	188,000,000	131,000,000
Westvaco*	200,000,000	180,000,000
Weyerhaeuser Paper	103,400,000	63,000,000

* Includes programs for completion beyond three-year period indicated.

million, the first gain since 1982. Spending for environmental controls at new paper mills accounts for most of the improvement. Planned expenditures amount to $205 million for water pollution control, up 33% from last year, and $191 million for air pollution abatement, an increase of 27%. Solid waste improvements for 1987-89 total $53 million, up 24% from last year's survey.

Spending up in every area. The strongest growth is in pulp mill spending, which is about 70% higher in this year's survey than last year. Mills report plans to spend an estimated $1.9 billion on pulp mill expansion and modernizaton projects over the 1987-89 period, up from about $1.1 billion for 1986-88. Pulp mill projects account for 24% of announced spending plans in the current survey, up from only 16% last year.

Capacity expansion is the driving force behind the growth in pulp mill spending. Despite the 70% increase, however, current pulp mill spending plans represent more of a return to normal than a big surge in spending. According to the American Paper Institute, mills expect to add about 1.9% a year to total woodpulp capacity over the next three years, or 3.6 million tpy. That's about double the amount of pulp capacity growth reported to API last year, but it is still slightly behind the ten-year average growth rate of 2.0%.

Most of the activity currently under consideration will be in integrated mills. Market pulp expansion will continue to be severely limited, with growth averaging only 1.1% a year through 1990, API reports. That compares with a ten-year historical growth rate of 4.1% a year. The two largest kraft market pulp projects under way currently are at Georgia-Pacific Corp.'s Port Hudson mill in Zachary, La., and Nekoosa Paper Corp.'s Ashdown, Ark., facility.

Mechanical pulp spending will get a boost from two greenfield newsprint mills, planned by Newsprint South Inc. and Ponderay Newsprint Co., and a major mill modernization at Blandin Paper Co.'s Grand Rapids, Minn., mill. All three projects are scheduled for completion in 1989.

Plans for power plant spending climb almost 18% in the current survey to $1.4 billion. Energy-related projects account for about 17% of overall spending reported for the 1987-89 period.

Despite a big jump in the number of cogeneration projects planned or under way, new power boiler installations and energy-related improvement programs continue to lag behind the pace set in the early- to mid-1980s. The main factor has been lower prices for oil and natural gas, which have caused the postponement of several projects. Two recent casualties are proposed cogeneration plants at Federal Paper Board's Sprague, Conn., mill and Erving Paper Mills' Erving, Mass., mill. Both projects have been postponed because of lower oil prices, although Federal may decide later this year to proceed with a smaller installation than the 69-MW plant originally planned.

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN U.S.

(over $50,000,000 at an existing mill site)

	1987-89
Appleton Papers, West Carrollton, Ohio	$ 61,000,000[2]
Blandin Paper, Grand Rapids, Minn.	344,000,000[1]
Boise Cascade, Rumford, Maine	194,500,000[2]
Boise Cascade, Sheldon Springs, Vt.	50,000,000
Champion International, Pensacola, Fla.	170,000,000
Champion International, Bucksport, Maine	108,900,000
Erving Paper Mills, Erving, Mass.	55,000,000
Federal Paper Board, Augusta, Ga.	132,150,000
Fraser, Madawaska, Maine	72,700,000
Gaylord Container, Bogalusa, La.	100,000,000[1]
Georgia-Pacific, Palatka, Fla.	70,000,000[1]
Georgia-Pacific, Zachary, La.	285,000,000[1]
Georgia-Pacific, Woodland, Maine	78,000,000[1]
P.H. Glatfelter, Spring Grove, Pa.	56,000,000
GNN/Nekoosa, Ashdown, Ark.	99,500,000
GNN/Great Northern, E.Millinocket, Maine	195,000,000
James River, Wauna, Ore.	119,800,000[1]
Longview Fibre, Longview, Wash.	92,000,000
Midtec Paper, Kimberly, Wis.	250,000,000[1]
Pentair/Port Huron, Port Huron, Mich.	70,000,000
Pentair/NOW, Niagara, Wis.	74,500,000
Pentair/Flambeau, Park Falls, Wis.	59,100,000[2]
Potlatch, Lewiston, Idaho	94,500,000
Potlatch, Cloquet, Minn.	103,000,000[1]
Scott Paper/S.D. Warren, Westbrook, Maine	70,000,000
Scott Paper/S.D. Warren, Muskegon, Mich.	120,000,000
Southeast Paper Mfg., Dublin, Ga.	300,000,000[1]
Stone Container, Florence, S.C.	104,010,000
Temple-Inland, Krannert, Ga.	170,000,000
Temple-Inland, Orange, Texas	60,000,000
Union Camp, Montgomery, Ala.	188,000,000
Westvaco, Luke, Md.	200,000,000[2]

1. Includes new paper machine.
2. Includes programs for completion in 1990 or later.

U.S. GREENFIELD MILL PROJECTS

STARTED UP IN 1987

Fort Howard, Rincon, Ga. Recycled tissue mill with first of four paper machines	**1987**
Pentair/Lake Superior, Duluth, Minn. 243,000-tpy clay filled supercalendered groundwood mill	**1987**

UNDER ACTIVE CONSIDERATION OR ANNOUNCED WITH STARTUP DATE

GLFP/Ponderay Newsprint, Usk, Wash. 180,000-metric-tpy TMP/newsprint mill	**1989**
Newsprint South, Grenada, Miss. 225,000-tpy TMP/newsprint mill	**1989**
Mead, Mahrt, Ala. 420,000-tpy coated natural kraft paperboard mill	**1991**

PROPOSED (NO STARTUP DATE)

Augusta Kraft, Augusta, Ga.
Proposed kraft linerboard mill; on hold
Kenaf International, South Texas
Proposed kenaf newsprint mill under study
Westbrook Wood Products, Medford, Ore.
TMP/newsprint mill under study

Even with these postponements, however, the cogeneration area remains fertile ground for spending. At least 17 new plants are currently planned for the 1987-89 period, and several others remain on the drawing board. The two most recent announcements are from Boise Cascade Corp., which plans to install a 75-MW power plant at Rumford, Maine, and Southeast Paper Manufacturing Co., which will install a power plant as part of a large-scale newsprint expansion at Dublin, Ga.

Announced spending for paper machine rebuilds and modifications in the 1987-89 period totals $1.5 billion, up 18% from last year's survey. Spending in this category has risen steadily in recent years and now accounts for about 19% of total outlays, up from 13% in 1985 and only 6% in 1983.

Paper machine upgrades have had a major role in the industry's modernization efforts since the current economic expansion began in 1982, particularly in the areas of cost cutting, product improvement, and grade realignment. An important trend that has emerged more recently is incremental capacity expansion through machine rebuilds, especially in linerboard. API reports that 14 linerboard machine rebuilds adding 50,000 tpy or more are planned for the 1988-90 period.

NEW MILLS AND MACHINES. At 25% of the total, new paper machines will consume the largest percentage of announced total spending for the 1987-89 period, according to *P&P*'s new survey. Outlays for new paper machines will top the $2.0 billion mark, up 12% from last year's survey.

Capacity expansion, more than any other area, marks the renewed vitality and optimism in capital spending plans. As of this time last year, nine new paper machines had started up in the previous year, 1986, and only two new paper machines and two new paper mills were on the horizon. In the subsequent 12 months, six new paper machines and three new paper mills have been approved for startup by 1989, four others have been tentatively approved for the early 1990s, and announcements are expected early this year on one or two others.

According to API's recent survey of capacity expansion plans, U.S. mills plan to add 6.1 million tpy of new capacity from 1988 through 1990, or 2.5% a year. Last year's three-year growth forecast averaged only 1.9% a year. Kraft paperboard, free-sheet papers, and newsprint are largely responsible for the increase. Newsprint capacity will rise sharply in 1990 after eight years in the doldrums, thanks to two greenfield mills approved for startup in 1989 at Ponderay Newsprint Co. in Usk, Wash., and Newsprint South Inc. in Grenada, Miss. Unbleached kraft paperboard will get a big boost from Mead's new 420,000-tpy natural kraft boxboard mill to be built in Mahrt, Ala.

Two new paper mills came online in 1987. Lake Superior Paper Industries, a joint venture of Pentair Inc. and Minnesota Power & Light Co., started up a new 243,000-tpy supercalendered groundwood paper mill in Duluth, Minn. And Fort Howard Corp. started up the first of four recycled tissue machines at its new mill in Rincon, Ga.

A second recycled tissue machine will come online at Rincon this year, raising capacity to about 500 tpd, and

NEW PAPER MACHINES IN U.S. AT EXISTING SITES

STARTED UP IN 1987

Linweave Fine Papers, Holyoke, Mass. **1987**
25,000-tpy machine—fine paper

UNDER CONSTRUCTION OR ANNOUNCED WITH STARTUP DATE

Fort Howard Paper, Rincon, Ga. **1988**
250-tpd machine—recycled tissue
Georgia-Pacific, Palatka, Fla. **1988**
210-in.-trim No. 5 Beloit—tissue
Georgia-Pacific, Zachary, La. **1988**
825-tpd, 348-in. Valmet—uncoated free-sheet
James River, Wauna, Ore. **1988**
70,000-tpy, 276-in. machine—tissue
Midtec Paper, Kimberly, Wis. **1988**
205,000-tpy, 222-in.-trim Voith; replaces four-coated free-sheet
Potlatch, Cloquet, Minn. **1988**
194-in.-trim Voith—coated free-sheet
Blandin Paper, Grand Rapids, Minn. **1989**
254,000-tpy, 306-in.-trim machine, replacing one—LWC
Gaylord Container, Bogalusa, La. **1989**
1,000-tpy kraft linerboard machine
Southeast Paper Manufacturing, Dublin, Ga. **1989**
210,000-tpy, 358-in. Valmet—newsprint
Fort Howard, Rincon, Ga. **1990-92**
Two additional tissue machines

PROPOSED (NO STARTUP DATE)

Atlas Paper Mills, Hialeah, Fla.
Second recycled tissue machine; in preliminary planning stage
Bear Island Paper, Ashland, Va.
200,000-metric-tpy newsprint machine under consideration
Champion International, Quinnesec, Mich.
Coated free-sheet machine under study; decision expected soon
Chesapeake, Menasha, Wis.
No. 4 tissue machine proposed
Great Northern Nekoosa, Ashdown, Ark.
210,000-tpy No. 64 uncoated free-sheet machine under study
International Paper, Undetermined
Plans new coated free-sheet machine in early 1990s
International Paper, U.S. South
Studying uncoated free-sheet machine; early 1990s target
James River, Unspecified
Two new tissue machines planned for 1989-94 period
Jefferson Smurfit, Newberg, Ore.
275,000-tpy machine in preliminary engineering stage—newsprint
Union Camp, Eastover, S.C.
Considering second free-sheet machine
Westvaco, Wickliffe, Ky.
New free-sheet machine under study
Willamette Industries, Hawesville, Ky.
Reportedly studying uncoated free-sheet machine

two more machines are planned for the early 1990s. Also in the tissue sector, Georgia-Pacific will start up its new No. 5 tissue machine at Palatka, Fla., this month, and James River will complete a new 70,000-tpy tissue unit at its Wauna, Ore., mill later in the year.

Georgia-Pacific plans to start up an 825-tpd uncoated free-sheet machine, which is reputedly the largest in North America, at its Port Hudson mill in late 1988. Two coated free-sheet machines are also scheduled for startup this year. Potlatch Corp. will replace three old uncoated free-sheet units with a new coated free-sheet machine at Cloquet, Minn. And Midtec Paper Corp. will replace four older coated free-sheet machines with a new 205,000-tpy unit at Kimberly, Wis.

In 1989, Gaylord Container Corp. will complete a new 1,000-tpd linerboard machine, the first to be installed since 1985. Also in 1989, Southeast Paper will start up a new 210,000-tpy recycled newsprint machine at Dublin, Ga., and Blandin will complete its new lightweight coated groundwood machine installation at Grand Rapids, Minn. The 254,000-tpy Blandin machine will replace one older unit.

More machines on the horizon? As was the case last year, several paper machine proposals are poised to move ahead quickly if market conditions warrant. In newsprint, Bear Island Paper Co. is studying a 200,000-metric-tpy newsprint machine for its Ashland, Va., mill, and Jefferson Smurfit Corp. is eyeing a new 275,000-tpy unit for Newberg, Ore. International Paper Co. is studying two new paper machines for startup in the early 1990s at unspecified locations. One would produce coated and the other uncoated free-sheet. New free-sheet paper machines are also under consideration at Union Camp, Westvaco, and Willamette.

CANADA

EXPANSION PLANS HEAT UP AGAIN; FOREIGN MONEY COULD SEND SPENDING EVEN HIGHER

■ Canadian pulp and paper producers plan even larger increases in capital investment over the next few years than do their U.S. counterparts, *P&P*'s survey shows. Companies report total outlays of C$6.7 billion for the 1987-89 period, an increase of 48% over last year. As in the U.S., capital spending will benefit from renewed interest in capacity expansion, and continued strong earnings will help fuel more ambitious spending programs.

Another factor is foreign investment, which has been attracted to Canada by the weakness of the Canadian dollar. Daishowa of Japan, for example, said recently that it is considering plans to spend up to $1 billion on new capacity in Alberta and British Columbia.

Production-related spending totals $6.4 billion for the 1987-89 period, up 49% from last year's total. Companies report environmental spending plans totaling $240 million, an increase of 14% from a year ago.

Spending by category. Spending is up in every process area except energy, with the strongest growth in outlays for new paper machines. Planned expenditures for new paper machines have more than doubled since last year, rising 107% to $2.2 billion, with eight new machines announced over the past 12 months.

Companies report plans to spend $896 millon on paper machine rebuilds in the 1987-89 period, a gain of 19% over last year's plans. This is the first increase in several years for paper machine rebuilds, which fell

CANADA—REPORTED CAPITAL EXPENDITURES FOR 1987-89+ BY REGION AND TYPE OF FACILITY (C$000)

PRODUCTION-RELATED EXPENDITURES

	WOOD/FIBER		PULPING		NEW MACHINES		MACHINE MOD.		ENERGY		MISC./PLANT	
Maritimes	C$ 31,415	17%	C$ 121,734	5%	C$ 94,300	4%	C$111,700	12%	C$ 23,000	9%	C$ 1,085	0%
Quebec	22,342	12%	1,157,204	47%	1,044,000	48%	533,046	59%	90,680	34%	244,131	58%
Ontario	24,475	13%	216,740	9%	537,000	24%	165,258	18%	28,015	10%	107,532	26%
Central	600	0%	12,400	1%	190,500	9%	1,500	0%	—	0%	—	0%
West	109,983	58%	953,559	39%	331,000	15%	84,508	9%	127,661	47%	68,748	16%
Total	**C$188,815**		**C$2,461,637**		**C$2,196,800**		**C$896,012**		**C$269,356**		**C$421,496**	

	ENVIRONMENTAL QUALITY SPENDING						TOTALS					
	WATER		AIR		SOLID WASTE		PRODUCTION		ENVIRONMENTAL		GRAND TOTAL	
Maritimes	C$ 9,000	8%	C$ 11,320	11%	C$ 1,400	7%	C$ 383,234	6%	C$ 21,720	9%	C$ 404,954	6%
Quebec	54,796	48%	32,904	32%	9,105	43%	3,091,403	48%	96,805	40%	3,188,208	48%
Ontario	8,754	8%	3,507	3%	5,360	25%	1,079,020	17%	17,621	7%	1,096,641	16%
Central	—	0%	—	0%	—	0%	205,000	3%	—	0%	205,000	3%
West	42,670	37%	55,785	54%	5,350	25%	1,675,459	26%	103,805	43%	1,779,264	27%
Total	**C$115,220**		**C$103,516**		**C$21,215**		**C$6,434,116**		**C$239,951**		**C$6,674,067**	

Provinces are assigned to regions as follows: Maritimes: New Brunswick, Newfoundland, Nova Scotia; Central: Manitoba, Saskatchewan; West: British Columbia, Alberta.

18% last year and 21% the year before.

Pulp mill spending gets a boost in the current survey period from two greenfield mechanical pulp installations and a number of new improvement projects at both chemical and mechanical pulp facilities. Reported spending for 1987-89 totals $2.5 billion, up 53% from last year's survey. Spending for woodyard improvements is up 24%, to $189 million.

The energy sector is the only process area not posting large gains for the 1987-89 period. Total outlays are reported at $269 million, virtually the same as last year.

Capacity growth still high. Capacity expansion plans picked up sharply in Canada in 1986, about a year before the U.S, helping to fuel the current growth in capital spending. That pattern appears likely to continue, according to the Canadian Pulp & Paper Assn.'s 1987 survey of expansion plans. Paper and paperboard capacity will grow an average of 2.9% a year between 1987 and 1989, CPPA reported. That's 93% above the ten-year average rate of 1.5% a year for 1977-86.

Newsprint heats up. Last summer, CPPA reported that newsprint capacity would grow a modest 275,000 tpy over the 1987-89 period, or 2.8%. Since then, however, two new paper machines have been approved for startup in 1989, raising the growth forecast to 721,000 tpy, an increase of 7.3%.

CIP will build a new $323-million CTMP/newsprint mill with capacity for 230,000 tpy at a site adjacent to its Tahsis Co. Ltd. market kraft pulp mill in Gold River, B.C. In the other project, Finlay Forest Industries Ltd. will integrate its 450-tpd refiner-mechanical market pulp mill at Mackenzie, B.C., with a new 216,000-tpy newsprint machine.

Looking beyond the current survey period, Great Lakes Forest Products has announced plans to install a new 240,000-tpy newsprint machine at its Thunder Bay, Ont., mill in 1991. The new unit will replace two older machines, adding 60,000 tpy to net capacity.

Printing/writing papers flying high. Groundwood specialty and printing papers will register the strongest growth among the paper grades, rising 46% by 1989, according to CPPA. Conversions to supercalendered paper at Abitibi-Price's Alma and Jonquière, Que., mills are the main factors in the 580,000-tpy increase, along with a new supercalendered paper machine at St. Marys Paper Inc. in Sault Ste. Marie, Ont.

Looking beyond 1989, Consolidated-Bathurst Inc. has announced plans to install a new 183,000-tpy groundwood specialties machine at its Grand'Mere, Que., mill in 1990, replacing two older units. Donohue is trying to secure government financial help to build a 210,000-tpy SC paper mill in Matane, Que.—a project that was abandoned last year by Saugbrugsforeningen of Norway.

Four new uncoated free-sheet paper machines are planned for the 1987-89 period, adding 53% to capacity for book, writing and miscellaneous paper. Domtar Inc. started up the first of two new 175,000-tpy paper ma-

TOP SPENDERS IN CANADA

Companies which report capital spending plans of C$100,000,000 or more, including both production and environmental programs

	1987-89	1986-88
Abitibi-Price*	C$288,500,000	C$213,700,000
Cascades	125,000,000	91,000,000
Champion International	285,000,000	3,000,000
CIP	568,500,000	128,200,000
Consolidated-Bathurst*	575,500,000	238,900,000
Crestbrook Forest Industries*	109,695,000	30,480,000
Domtar	934,818,000	831,208,000
Donohue	200,500,000	170,000,000
E.B. Eddy Forest Products*	280,815,000	205,526,000
Fibreco Export	170,000,000	170,000,000
Finlay Forest Industries	198,000,000	n.a.
Great Lakes Forest Products*	392,000,000	19,500,000
Kruger*	270,000,000	258,600,000
MacMillan Bloedel	126,000,000	16,000,000
Millar Western Pulp	200,000,000	185,000,000
Ontario Paper*	479,312,000	208,600,000
Reed	146,000,000	68,800,000
St. Marys Paper	145,000,000	19,000,000
Tembec*	269,952,000	103,000,000
Weyerhaeuser Canada	202,500,000	202,500,000

*Includes programs for completion beyond three-year period indicated.

MAJOR MODERNIZATION/ EXPANSION PROJECTS IN CANADA

(over C$50,000,000 at an existing mill site)

	1987-89
Abitibi-Price, Thunder Bay, Ont.	C$ 55,000,000
Abitibi-Price, Chandler, Que.	113,000,000[2]
Abitibi-Price, Jonquière, Que.	95,000,000
Canfor, Port Mellon, B.C.	93,770,000[2]
Cascades, Port Cartier, Que.	90,000,000
Champion International, Hinton, Alta.	285,000,000
CIP, Gatineau, Que.	102,000,000[1]
CIP, La Tuque, Que.	62,000,000
Consolidated-Bathurst, Bathurst, N.B.	94,300,000[1]
Consolidated-Bathurst, Grand'Mere, Que.	292,000,000[1,2]
Consolidated-Bathurst, Shawinigan, Que.	81,600,000
Crestbrook, Skookumchuck, B.C.	109,695,000[2]
Crown Forest Industries, Elk Falls, B.C.	55,000,000
Domtar, Dolbeau, Que.	83,820,000
Domtar, Windsor, Que.	785,900,000[1,2]
Donohue, Clermont, Que.	189,500,000[1]
E.B. Eddy Forest Products, Espanola, Ont.	168,498,000[2]
E.B. Eddy Forest Products, Ottawa-Hull, Que.	112,317,000[2]
Finlay Forest Industries, Mackenzie, B.C.	198,000,000[1]
Great Lakes Forest Products, Dryden, Ont.	196,130,000[1]
Great Lakes Forest Products, Thunder Bay, Ont.	276,880,000[1,2]
Kruger, Corner Brook, Nfld.	200,000,000[2]
Kruger, Bromptonville, Que.	70,000,000[2]
MacMillan Bloedel, Powell River, B.C.	76,000,000
Ontario Paper, Baie Comeau, Que.	343,943,000[2]
Ontario Paper, Thorold, Ont.	185,369,000[2]
Quesnel River Pulp, Quesnel, B.C.	80,000,000
Reed, Quebec City, Que.	146,000,000
Repap Enterprises, Prince Rupert, B.C.	60,000,000
St. Marys Paper, Sault Ste. Marie, Ont.	145,000,000[1]
Soucy, Rivière du Loup, Que.	57,300,000[2]
Tembec, Temiscaming, Que.	269,952,000[1,2]
Weyerhaeuser Canada, Prince Albert, Sask.	202,500,000[1]

1. Includes new paper machine.
2. Includes programs for completion in 1989 and later.

chines late last year at its Windsor, Que., mill. The second machine is due for startup in 1989. Weyerhaeuser Canada Ltd. is integrating its market bleached kraft pulp mill at Prince Albert, Sask., with a new 220,000-tpy uncoated free-sheet machine targeted for startup in 1989. Great Lakes Forest Products will also start up a new machine next year, a 175,000-tpy unit at Dryden, Ont.

Market CTMP leads pulp growth. The strongest growth in the market pulp arena is in mechanical pulp, both TMP and CTMP. These grades, which account for only 7% of Canadian market pulp capacity, are expected to grow 66% by 1989, adding 391,000 tpy to capacity.

Construction is well under way on two new market bleached CTMP mills scheduled for startup later this year: Millar Western Pulp Ltd. at Whitecourt, Alta., and Fibreco Export Inc. at Taylor, B.C. Interest in this area remains high, with at least two other mills under study in British Columbia and one in Quebec. Activity has picked up somewhat in the bleached kraft market pulp sector, but capacity growth continues to be offset by integration of existing facilities, such as Weyerhaeuser's Prince Albert, Sask., mill. Kraft market pulp capacity is expected to grow 4.4%, or 303,000 tpy, by 1989.

Last year, Champion International approved a $285-million modernization and expansion program that will add 210,000 tpy to capacity at its Hinton, Alta., mill. Also in Alberta, Daishowa Paper is conducting a final feasibility study for a new 340,000-tpy bleached hardwood kraft market pulp mill in Peace River. Cost of the project would be $500 million. ■

REPORTED CANADIAN EXPENDITURES BY PROVINCE, 1987-89[1] (C$000)

	PRODUCTION	ENVIRONMENTAL	TOTAL
Alberta	C$460,000	C$25,000	**C$ 485,000**
British Columbia	1,215,459	78,805	**1,294,264**
Manitoba	2,500	—	**2,500**
New Brunswick	121,500	2,000	**123,500**
Newfoundland	214,500	15,000	**229,500**
Nova Scotia	47,234	4,720	**51,954**
Ontario	1,079,020	17,621	**1,096,641**
Quebec	3,091,403	96,805	**3,188,208**
Saskatchewan	202,500	—	**202,500**
Total	**C$6,434,116**	**C$239,951**	**C$6,674,067**

1. Includes projects, as announced, to be completed in 1990 and later.

NEW PAPER MACHINES IN CANADA AT EXISTING MILL SITES

(metric tons)

STARTED UP IN 1987 **Startup**

CIP, Gatineau, Que. **1987**
175,000-tpy, 259-in.-trim Voith—newsprint
Domtar, Windsor, Que. **1987**
175,000-tpy, 330-in. Beloit—uncoated free-sheet
Donohue, Clermont, Que. **1987**
180,000-tpy, 330-in.-trim Valmet-Dominion—newsprint

UNDER CONSTRUCTION OR ANNOUNCED WITH STARTUP DATE

Consolidated-Bathurst, Bathurst, N.B. **1988**
150,000-tpy machine, replacing two—corrugating medium
St. Marys Paper, Sault Ste. Marie, Ont. **1988**
140-tpd, 184-in.-trim Tampella—SC groundwood
Domtar, Windsor, Que. **1989**
175,000-tpy, 330-in. Beloit—uncoated free-sheet
Finlay Forest Industries, Mackenzie, B.C. **1989**
216,000-tpy, 303-in.-trim Voith—newsprint
Great Lakes Forest Products, Dryden, Ont. **1989**
175,000-tpy, 285-in.-trim—uncoated free-sheet
Weyerhaeuser Canada, Prince Albert, Sask. **1989**
220,000-tpy, 318-in.—uncoated free-sheet
Consolidated-Bathurst, Grand'Mere, Que. **1990**
183,000-tpy unit, replacing two—groundwood specialties
Tembec, Temiscaming, Que. **1990**
110,000-tpy, three-wire machine—bleached paperboard
Great Lakes Forest Products, Thunder Bay, Ont. **1991**
240,000-tpy machine, replacing two—newsprint

PROPOSED (NO STARTUP DATE)

Abitibi-Price, Iroquois Falls, Ont.
Proposed newsprint machine; timing not decided
Normick Perron, Amos, Que.
Proposed second newsprint machine

GREENFIELD MILLS—CANADA

(metric tons)

UNDER CONSTRUCTION OR ANNOUNCED WITH STARTUP DATE

Fibreco Export, Taylor, B.C. **1988**
180,000-tpy, two-line market bleached CTMP mill
Miller Western Pulp, Whitecourt, Alta. **1988**
210,000-tpy, two-line market bleached CTMP mill
CIP/Tahsis, Gold River, B.C. **1989**
230,000-metric-tpy newsprint mill with one Beloit Bel Baie III machine and CTMP furnish; adjacent to market pulp mill

PROPOSED (NO STARTUP DATE)

Daishowa Paper, Peace River, Alta.
Conducting final feasibility study for 340,000-metric-tpy bleached hardwood (aspen) kraft market pulp mill
Dong Bang Chemical Co., Ocean Falls, B.C.
Studying 82,500-tpy neutral sulfite anthraquinone market pulp mill
Dohohue, Matane, Que.
Proposed 210,000-tpy supercalendered groundwork paper mill
Louisiana-Pacific, Chetwynd, B.C.
Proposed 115,000-tpy CTMP mill and waferboard plant
Makin Pulp & Paper, Britannia Beach, B.C.
135,000-tpy coated and uncoated publication papers mill with one free-sheet and one groundwood machine
Nouvelle Chapelle-Darblay, Rivière-du-Loup, Que.
Studying 175,000-metric-tpy coated paper mill with one paper machine, TMP furnish
Tembec, Val d'Or, Que.
Studying feasibility of 100,000-tpy bleached CTMP mill
Unidentified group, Whitecourt, Alta.
Newsprint mill proposed by unidentified publisher group
West Fraser Mills, Bond Siding, B.C.
Proposed CTMP mill

PULP & PAPER

February 1988

C3975-2
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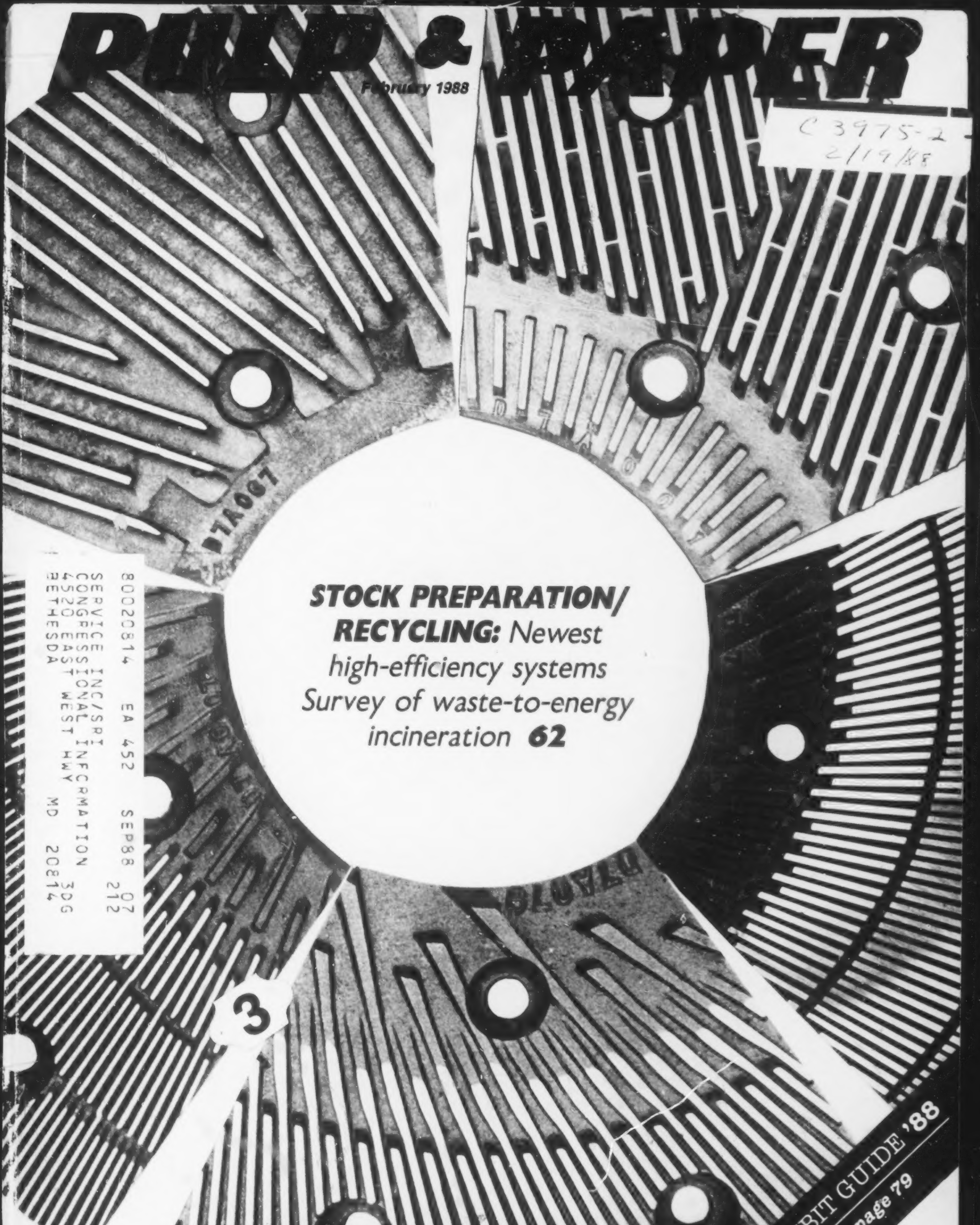

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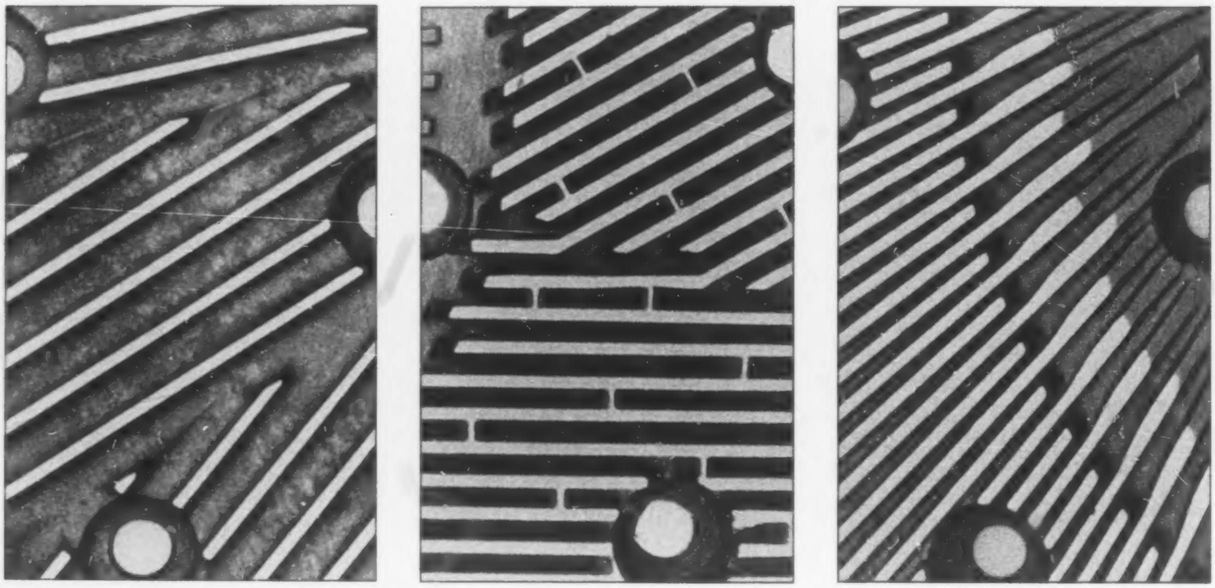
FEBRUARY



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Among latest developments in stock preparation/recycling are high-efficiency refiner plates. A review of this technology begins on p. 152. (Photo courtesy of Sprout-Bauer.)

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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ABP BPA

Subscriptions & Address Change: Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of $60.00 a year in the U.S. All subscriptions to other countries: $80.00 a year, except Europe and Mediterranean, $90.00 (air service included). Single copy, $6.00, except Buyers Guide, $30.00. Photocopies of articles and complete microform volumes available through University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106.

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Circulation Department, PULP & PAPER,
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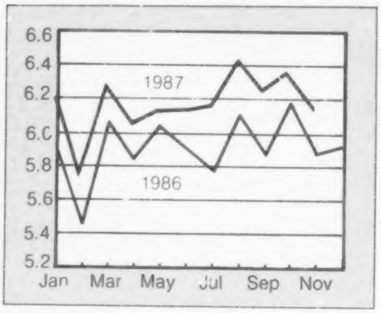
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.1 million tons in November, a gain of 4.7% over the previous year, according to American Paper Institute figures. With just one month to go in 1987, production was expected to reach a record 74 million tons for the year, up 4.9% from 1986. The seasonally adjusted rate of paperboard production was 37.3 million tpy in November, up 5.7% from the previous year. The paper sector posted a weaker 36.7-million-tpy performance, up 4.1% from 1986.

Among major grades, uncoated free-sheet took over from coated paper as the strongest growth sector in the September-November period, API reported. Newsprint and tissue continued to exhibit steady growth, while kraft packaging papers remained depressed. Unbleached kraft linerboard continued as the strongest paperboard grade, followed by recycled board. Corrugated box shipments were very strong in November, according to the Fibre Box Assn., rising 8.3% above November 1986.

Canadian newsprint shipments totaled 785,000 metric tons in November, according to the Canadian Pulp & Paper Assn., down 0.6% from the previous year. Woodpulp shipments climbed 2.7% to 683,000 tons. Operating rates stood at 98% for both grades in Nov., up from 93% in 1986. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	Nov.	482	1.9	5,828	3.6
Uncoated groundwood (s)	Nov.	112	-16.4	1,505	-2.5
Coated paper (s)	Nov.	581	8.6	6,841	9.7
Uncoated free sheet (s)	Nov.	926	10.5	10,949	5.3
Other printing/writing	Nov.	110	1.9	1,379	-1.1
Total packaging and other paper (s)	Nov.	419	0.5	5,056	-1.2
Tissue	Nov.	454	7.1	5,308	4.1
Total paper	**Nov.**	**3,083**	**5.3**	**36,866**	**4.1**
Unbleached kraft paperboard	Nov.	1,528	4.9	18,814	6.7
Semichemical medium	Nov.	458	0.9	5,625	4.4
Bleached paperboard	Nov.	345	-0.9	4,389	2.9
Recycled paperboard	Nov.	741	7.2	8,623	6.0
Total paperboard	**Nov.**	**3,071**	**4.1**	**37,451**	**5.7**
Total U.S. paper and paperboard output	**Nov.**	**6,155**	**4.7**	**74,317**	**4.9**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	Oct.	5,067	4.0	59,542	4.7
Market pulp production	Oct.	670	13.0	8,082	7.9
Wastepaper consumption at paper/board mills	Oct.	1,619	14.1	18,366	6.4
Pulpwood consumption (cords)	Oct.	7,984	2.6	94,060	3.2
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft^2)	Nov.	23.281	8.3	274.258[6]	4.7
Containerboard inventories at U.S. box plants and mills	Nov. 1	2,355	8.0		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	Oct.	1,099	10.1	12,486	8.0
Imports of Canadian newsprint	Oct.	710	2.9	8,629[6]	3.8
U.S. paper exports (including products)	Oct.	415	13.4	5,206	14.9
Exports of unbleached kraft linerboard	Oct.	168	10.5	2,231	10.3
Exports of woodpulp	Oct.	333	-3.2	4,798	7.0
Norscan pulp inventories[4]	Nov. 30	911	-12.0		
Norscan pulp operating rates[4]	Nov.	96%	98%	94%	98%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	Nov.	785	-0.6	6,405[6]	5.2
Operating rates	Nov.	98%	93%	97%	93%
Inventories held by U.S. consumers	Nov. 30	1,354	7.4		
Other paper/board shipments	Nov.	539	5.7	4,221	6.2
Woodpulp shipments (export only)	Nov.	683	2.7	5,313	2.3
Operating rates	Nov.	98%	93%	97%	92%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp.
5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

TISSUE: Producers seek relief from rising pulp prices; volume should remain strong through 1988

Grade structure: Tissue falls into two major groups: sanitary and "other." About 98% of total output is sanitary, including bathroom, facial, toweling, napkins, basestock for sanitary stock, wadding, and wipes. The "other" group includes basestock for waxing, wrapping, and miscellaneous.

The two major markets for tissue are consumer, and commercial and industrial (C&I). Consumer tissue is purchased by people at retail outlets, while industrial tissue is bought by hotels, offices, restaurants, and factories. Typical basis weights for tissue include 12 to 14 lb/3,000 ft² for single-ply bathroom tissue and 32 to 39 lb/3,000 ft² for single-ply towel.

Production/capacity: The American Paper Institute estimates that U.S. capacity for tissue paper will expand at an annual rate averaging 1.9% over the next three years to reach a total of 5.955 million tons in 1990. This is down from the previous decade's 2.2% average annual growth rate. Last year's capacity was 5.635 million tons, according to the API, while capacity in 1988 is expected to reach 5.771 million tons.

Toward the end of the first half of this year Fort Howard Corp. will start up the second recycled tissue machine (No. 17) at its Savannah River mill in Rincon, Ga. Like the first machine at the mill (No. 16), this unit will have capacity for 250 tpd. The third machine is slated to start up in late 1989. Although the installation date of the fourth machine has not been announced, Fort Howard has shown no signs of backing off from its announced plan to have four tissue machines at the mill, giving it capacity for about 1,500 tpd of tissue, towel, and napkin products for both the C&I and consumer markets. The company is also applying for permits to install a ninth tissue machine at its Green Bay, Wis., mill, but no startup date has been announced.

James River Corp. is going to start up a 70,000-tpy tissue machine at its Wauna Div. mill in Clatskanie, Ore., toward the end of the year. The company has revised its U.S. tissue expansion plans and said it will start up two new tissue machines instead of three between 1989 and 1994. Chesapeake Corp. is planning to spend $148 million at its Wisconsin Tissue Mills Inc. subsidiary, Menasha, Wis., to install an 80,000-tpy twin-wire tissue machine to start up in 1990.

Despite this good news, Scott Paper Co. and James River both announced major investment plans last year geared toward cornering the faster-growing western European tissue market. Scott will spend over $250 million over the next three years to expand its sanitary paper capacity in the region.

In a purchase it characterized as the "cornerstone for European expansion," James River bought 50% of the Kaysersberg Div. of French papermaker Beghin-Say for $243 million. Kaysersberg has capacity for about 128,000 metric tpy of household tissue and related products at three mills located in France.

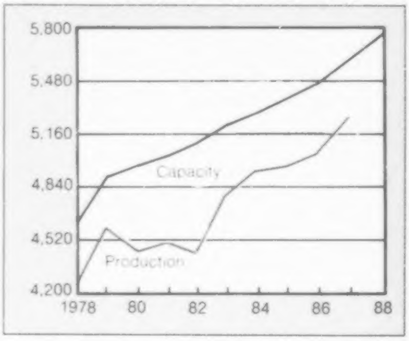
Outlook: Volume throughout 1987 remained strong and this is expected to be the case in 1988 as well. For the first nine months of 1987, annualized tissue production was running 3.8% above year-earlier levels at a rate of 5.25 million tons, the American Paper Institute reports.

1988 is shaping up to be the year in which producers of consumer tissue will finally succeed in passing on rising pulp, wastepaper, and chemical costs in the form of an across-the-board price hike. The hike will average about 5%, observers predict. Most consumer tissue prices have not been raised since 1981, although industry observers hint that tissue producers have been liberal in taking sheet count reductions.

Producers of C&I tissue implemented an across the board price increase averaging 5% effective November 1987. This followed a successful 6% price increase led by Fort Howard last spring.

Prices: Price trends tracked by Bureau of Labor Statistics' producer price index for converted sanitary paper and health products are as follows (year-end, 1967 = 100): 1980, 325.1; 1981, 347.4; 1982, 353.7; 1983, 361.2; 1984, 365.6; 1985, 377.2; 1986, 382.2; 1987 (third quarter), 386.6. (For historical data see *P&P PriceBook 2*.) ■

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1986	1987e	1988e
Production	5,095	5,279	5,338
Capacity[1]	5,472	5,635	5,771
Utilization rate	93.1%	93.7%	92.5%
Imports[2]	66	55	50
Exports[2]	17	36	38
Apparent U.S. consumption	5,144	5,298	5,350
lb/capita	42.7	43.6	43.6
GNP ratio	1.39	1.39	1.39

e = *P&P* estimate

1 American Paper Institute data

2 U.S. Dept. of Commerce data

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Scott Paper	1,050	18.2
2. James River	1,041	18.0
3. Procter & Gamble	900	15.6
4. Fort Howard	895	15.5
5. Georgia-Pacific	540	9.4
6. Kimberly-Clark	430	7.5
7. Erving Paper Mills[1]	150	2.6
8. Pope & Talbot	148	2.6
9. Chesapeake	120	2.1
10. APL Corp.	95	1.6

Market share of top five companies:
71.5%

Market share of top ten companies:
93.0%

Total U.S. capacity (1988):
5.771 million tons

1 Sale of Lockland, Ohio, mill pending.

power needs of the expanded facility, which will therefore make Bowater Mersey the largest consumer of electrical power in the province, it was recently noted.

Conversion to all TMP will enable the mill to make better use of the available wood supply, the company reported. Currently, spruce and fir primarily are used. With 100% TMP production, the mill will be able to use some hemlock, pine, and hardwoods. The province has guaranteed the availability of adequate wood supplies, it was noted.

The project will also entail improvements to the woodyard and the woodroom, newsprint storage, and shipping facilities.

In 1985, Bowater Mersey worked out an agreement with the local municipality protecting the company from a local tax increase based on capital improvement expenditures. "Our taxes were significantly higher than those of other mills in Atlantic Canada, and the agreement will help to bring them in line," noted Anthony P. Gammie, Bowater chairman and CEO. ■

BCFP to spend C$32 million expanding CTMP line

British Columbia Forest Products Ltd. said excavation work has begun on a C$32-million expansion of its chemithermomechanical pulp (CTMP) mill in Crofton, B.C. The expansion is expected to raise CTMP capacity to 555 metric tpd from 320 tpd, thus enabling the mill to supply all of its fiber requirements for newsprint production. Startup is scheduled for the fall of 1988.

BCFP said the project was undertaken as a result of 50%-owned Finlay Forest Industries Ltd.'s decision to integrate its market pulp mill with a new machine that is expected to start up in March 1989. Replacement of the refiner mechanical pulp that is currently being supplied to the Crofton operation from Finlay's Mackenzie, B.C., mill will result in "substantial costs savings" for BCFP, the company said.

The Crofton mill project includes expansion of the chip handling system and addition of a third refiner line and a second reject refining system. Sprout-Bauer Co. will supply the refiner system, including the chip washing and interconnecting screw conveyors and impregnators. Canadian General Electric Co. will supply the refiner motors. Chip thickness screening will be supplied by Rader Companies Inc. Hooper Corp. will supply primary screening and a hydraulic reclaimer. A disc filter is scheduled to be delivered from Celleco Inc. ■

Cascades ramps up recycled news machine at Niagara

Cascades Niagara Falls Inc. started up a 30,000- to 35,000-short-tpy recycled newsprint machine Jan. 8 at the former Nitec Paper Corp. mill in Niagara Falls, N.Y. No. 2 corrugating medium machine will come online in February, a spokesman said. No. 2 has a similar capacity rating. The company had earlier indicated that both machines would manufacture recycled containerboard.

Richard Joncas, who was appointed mill general manager in August, said that No. 1 machine will use 100% recycled fiber to manufacture newsprint. Joncas added that the machine is capable of making linerboard as well.

No. 1 machine previously was used for making lightweight coated paper. Cascades rebuilt the wet end systems, including a new Voith headbox. The project supervisor was Le Perriere & Verrault of Trois Rivières, Que., overseer of the reconstruction of the company's Rockingham, N.C., tissue mill in 1984. More work is planned for the Niagara mill, Joncas said.

Both machines are expected to be running at full capacity by the beginning of the second quarter. ■

U.S. is the best place to make newsprint

In a recent Canadian government study comparing newsprint manufacturing costs in the world's top five producing regions, Norway ranks as the most competitive during the period from 1983 through 1986. However, a shift in currency exchange rates since 1986 has swung the cost advantage in favor of the U.S.

The report, called "Newsprint Cost Study, 1982-1986," shows that the production cost per finished ton of newsprint on a delivered basis is currently lowest for U.S. producers in both the West and the South using current exchange rates. Finland ranks the highest, while Norway comes in third. In 1986 Norway was the low-cost producer, while Finland and Sweden had the highest costs.

The findings, done by Price Waterhouse for the Forest Sector Advisory Council's newsprint subcommittee, update an earlier report prepared for the years 1982 and 1983. FSAC is an advisory body to the Canadian federal government. The newsprint-producing regions covered in the study include Canada, the western U.S., the southern U.S., Finland, Sweden, and Norway.

Comparing the major cost items of each region in 1986, Norway has the lowest cost of energy. Labor cost is lowest in Finland. The U.S. South has the lowest costs for furnish material and delivery. That same year, the average annual capacity per machine ranged from a low of 96,000 metric tons in Canada to a high of 170,000 tons in Finland.

Canada and the U.S. improved

Newsprint costs 1986 (U.S.$/metric ton).

	Canada	U.S. West	U.S. South	Finland	Sweden	Norway
Furnish material	$112	$129	$ 93	$176	$156	$132
Energy	56	75	75	87	79	35
Labor	82	54	67	38	60	53
Other	49	56	80	45	62	45
Mill level cost	299	314	315	346	357	265
Corp./selling cost	20	9	16	24	17	12
Cost before delivery	**319**	**323**	**331**	**370**	**374**	**277**
Delivery	62	45	28	70	55	67
Total delivered cost	**$381**	**$368**	**$359**	**$440**	**$429**	**$344**

Source: Forest Sector Advisory Council of Canada, "Newsprint Cost Study, 1982-86."

their rankings as the Nordic countries declined in 1986 largely due to the effect of the currency exchange adding about $100 to the delivered cost per ton of newsprint produced in the Nordic countries.

The greatest swing in the rankings from 1982 to 1986 occurred for the U.S. South, which was the lowest in 1982, the second highest in 1985, the second lowest in 1986 (and the lowest in 1987, based on year-end exchange rates). These swings were related to labor unrest in 1983 and startup costs in 1984 and 1985.

Significant changes in exchange rates have dramatically altered the Nordic countries' rankings, the study notes. In 1985 Norway, Sweden, and Finland were the three lowest cost producers. In 1986, Sweden and Finland ranked fifth and sixth overall, while Norway's cost advantage was substantially reduced. At the same time, Canada's ranking as number four also largely resulted from shifts in currency exchange rates. ■

ACQUISITIONS/MERGERS

Manfor Ltd. up for sale; province seeks investment

Government officials of the Canadian province of Manitoba confirmed they are again interested in selling Manfor Ltd. and are seeking a buyer to invest additional capital to ensure the long-term competitiveness of the 400-metric-tpd unbleached kraft pulp and paper mill in The Pas, Man.

Unlike prior attempts to sell the mill, the Manitoba government now feels more confident of a divestiture. "Manfor's circumstances have improved remarkably in the last couple of years, financially and otherwise. It is certainly not a question of a fire sale," said Jerry Storie, minister responsible for Manfor. In this latest attempt to sell the mill, the province has added conditions that will have to be met prior to any transfer of ownership. These additional conditions include "additional investment, diversification of the product, best use of the resources, as well as maintaining or increasing the employment levels," said Storie.

Manfor, the largest Canadian producer of unbleached kraft paper, has been owned by the Manitoba government since 1973 after being placed in receivership. Although it had been on the block before, the mill's history of operating losses since its inception in 1969 has discouraged investors. In 1987, however, the mill was expected to have made C$10 million and may earn even more in 1988 thanks to stronger prices for kraft paper. This follows losses of C$5.3 million in 1986 and C$31.3 million in 1985.

The province reopened discussions on selling the mill again this past spring, Storie noted. So far, seven Canadian companies have looked at the mill and have been asked to submit proposals to the province. No provincial financial assistance is being offered, although some of the investors have indicated they would seek federal aid. Among the companies interested in Manfor are Kruger Inc., Repap Enterprises Corp., West Fraser Mills Ltd., and Weyerhaeuser Co. Offshore investors have also made inquiries, said Storie. Some potential buyers are probably considering the eventual conversion of the mill to bleached pulp and paper grades.

The mill has one single 246-in.-width Dominion Engineering fourdrinier machine equipped with a Flakt dryer. A new press section was added in 1985 as part of a C$40-million modernization. It is the only mill in North America that can produce air-dried multiwall sack paper. ■

FC purchases all of Crown Forest, ups control of BCFP

Fletcher Challenge Ltd. of New Zealand now owns 100% of the stock of Crown Forest Industries Ltd. In December Fletcher acquired the 4% of Crown's Class A common shares that it did not already own for C$80/share or C$32 million.

Fletcher Challenge also increased its holding in British Columbia Forest Products Ltd. from 48% to 67.4% in a C$19/share stock offering that ended Dec. 22. When FC made the offer in November, it said it wanted to increase its ownership beyond 50%. Industry observers are convinced that FC will make a bid to purchase the rest of BCFP's shares when market conditions are right. If it succeeds in acquiring the remaining shares, FC is almost sure to merge Crown Forest with BCFP, creating a forest products company with over $2 billion in assets, according to the *Globe & Mail*.

This scenario will require FC to placate the directors of BCFP, who felt that the latest tender offer did not reflect the value of the company and urged shareholders not to sell. ■

Erving Paper may sell Ohio tissue mill to workers

Erving Paper Mills and the employees of the company's Fox Paper Div. in Lockland, Ohio, are negotiating an employee buyout of the division. The Lockland mill has capacity for about 100 tpd of napkins, facial tissue, crepe paper, kraft paper, and bag paper. It currently employs about 120 people. The buyout is expected to be completed during the first quarter. The employees said they will try to diversify the mill's product line by producing higher-basis weight paper, among other things. Erving announced last fall that it intended to close the mill. ■

EXPANSIONS

Korean may build recycled paper mill in Missouri

The Chamber of Commerce of St. Joseph, Mo., has signed a letter of intent with Rep. Korean businessman Hwa-Jin Yu for the construction of a recycled paper mill, to be called Mi Ho Paper Co., that is estimated to cost at least $41 million. Yu owns two paper companies in Korea, Mi Ho Paper Co. Ltd. and Hwa-Jin Paper Co. Ltd. Yu plans to supply $9 million of the capital that is required for startup, with the balance of the financial package being arranged by the Chamber of Commerce.

Yu is still deciding what the product mix of the mill will be, but a spokesman at the Chamber of Commerce said most of the advanced purchase orders Yu has received are for fine coated paper, in which case the mill would presumably have to buy some pulp. The mill might also make recycled boxboard. About 70% of the mill's product will be exported to Rep. Korea, and the rest will be sold domestically. The mill is expected to employ between 150 and 200 people.

Mi Ho will purchase wastepaper within a 500-mile radius of St. Joseph. Wastepaper dealers are eager for the mill to start up since there are no big waste-based mills in the area and this would create a new market. ■

FORECAST

Pulp capacity to grow 1.4%, FAO predicts

Worldwide capacity for paper-grade woodpulp is projected to increase by 1.4% annually from 1986 to 1991, reaching 165.6 million metric tons, according to the United Nations' Food & Agriculture Organization's most recent *Pulp and Paper Capacities* survey. Total paper and board capacity is expected to grow 1.9% during the period to 248.1 million tons.

Both of these growth rates are slower than those during the 1981-86 period, when woodpulp capacity increased 1.7% and paper and board capacity grew 2.2%. (It should be noted that capacity figures for the U.S.S.R. remained unchanged from the 1985-90 survey, which presumably does not reflect reality.)

In 1986, capacity for paper-grade woodpulp was estimated at 154.4 million tons, an average annual rise of 1.7% from 1981. Capacity is to increase by 11.3 million tons by 1991—a 1.4% annual rise. Capacity for paper and board in 1986 was 226.2 million tons, an average annual increase of 2.2% from 1981. By 1991 this is to increase by 21.9 million tons to 248.1 million tons.

The fastest growth in paper and paperboard capacity over the next five years is expected to occur in the developing countries of Africa, Latin America, and Asia, which will see capacity growth of 2.5% annually. This is a decline from the 5.3% growth rate that these areas enjoyed from 1981 through 1986. The centrally planned economies are expected to be a close second with a growth rate of 2.1% over the next five years. This group is the only one of the three that is expected to grow at a faster rate than the 1981-86 period.

The developed countries will account for 76.2% of total paper and paperboard capacity in 1991, which is the same amount forecast in the FAO's previous survey. Developing countries are expected to have 10.2% of the paper and board capacity in 1981, while centrally planned economies will account for 13.6%. ■

FAO forecasts for world pulp and paper capacity.

World woodpulp capacity, 1986-91

	Capacity (000 metric tons)		Annual average increase	
	1986	**1991**	**1981-86**	**1986-91**
World total	154,353	165,637	1.7%	1.4%
Developed economies	125,870	133,814	1.4	1.2
North America	76,700	79,668	1.5	0.8
Japan	12,268	13,144	−0.1	1.4
Western Europe	32,744	36,662	1.3	2.3
Oceania	2,708	2,890	3.7	1.3
Others	1,450	1,450	14.8	—
Developing economies	9,625	12,161	5.2	4.8
Africa	853	1,009	12.5	3.4
Latin America	6,528	8,612	3.7	5.7
Asia	2,244	2,540	7.3	2.5
Centrally planned economies	18,858	19,662	1.5	0.8
Asia	2,423	3,166	−2.8	5.5
Eastern Europe	4,385	4,446	2.5	0.3
U.S.S.R.	12,050	12,050	2.1	—

World paper and paperboard capacity, 1986-91

	Capacity (000 metric tons)		Annual average increase	
	1986	**1991**	**1981-86**	**1986-91**
World total	226,226	248,135	2.2%	1.9%
Developed economies	173,552	189,165	2.0	1.7
North America	85,702	91,550	2.2	1.9
Japan	24,617	26,771	1.8	1.7
Western Europe	58,209	65,343	2.2	2.3
Oceania	3,038	3,455	4.7	2.6
Others	1,986	2,046	6.1	0.6
Developing economies	22,382	25,302	5.3	2.5
Africa	1,064	1,177	6.6	2.0
Latin America	12,483	14,007	4.8	2.3
Asia	8,835	10,118	5.3	2.5
Centrally planned economies	30,292	33,668	1.4	2.1
Asia	9,607	12,534	0.3	5.5
Eastern Europe	6,685	7,134	1.4	1.3
U.S.S.R.	14,000	14,000	2.3	—

Source: FAO Pulp & Paper Capacities 1986-1991

CONVERTED PRODUCTS

Mead expands carbonless capacity by 20%

Mead Corp. will expand its carbonless paper capacity by 20% with the announced acquisition of the Indianapolis, Ind., carbonless coating facility of Standard Register Co. Mead currently produces 150,000 tons of carbonless copy paper at its Chillicothe, Ohio, plant. Indianapolis is capable of producing 30,000 tpy.

"We think that we've outgrown the market," said Jerome F. Tatar, president of Mead's Fine Paper Div. "We've always produced our carbonless in Chillicothe, and we've started to reach some limitations as to how we could get additional capacity in that facility." "This is our first offsite expansion of carbonless, and it gives us the flexibility for future expansions," said Mead spokesman, Tom Hausman. Tatar added that Indianapolis may be able to accommodate up to three or four coaters. Mead will add some rewinders and some warehousing space to take better advantage of current capacity. ■

MANAGEMENT

JUST-IN-TIME DELIVERY PLAN PRESENTS CHALLENGES TO BOX MAKERS, SUPPLIERS

New production method from Japan offers many advantages but will require close cooperation between converters and mills

By JAMES F. STEVENSON

Just-in-time delivery of a product to a customer is a concept that seeks to control work-in-process inventory by keeping just as much of an item on hand as will be needed in the immediate future.

Initially used with great success in the Japanese automotive industry, its use has spread to other industries and countries, including the U.S. But American managers, who first latched onto Japanese-style, just-in-time production methods as a panacea for all of their manufacturing woes, soon found that making the cure work was tougher than expected. The just-in-time regimen calls for reducing the number of suppliers, renegotiating supplier contracts, and tinkering with plant layouts. But people also have to change their basic attitudes—managers as well as workers. The men and women in charge have to abandon the security blanket that inventory often represents and learn to trust their suppliers as never before.

As perfected by Japanese companies like Toyota, just-in-time delivery is an exacting discipline. Its basic premise is that parts and raw materials should arrive at the factory just as they are needed in the manufacturing process. This eliminates inventories and the costs of carrying them. But it can also result in additional costs for the box maker in terms of both waste and productivity.

A NIGHTMARE FOR SUPPLIERS? Too often, however, the manufacturer's dream of reduced costs turns out to be a nightmare for suppliers. They must ensure that materials get to the plant at the right time and, in some cases, that different parts, sizes, and colors arrive in precisely the right sequence for assembly. Even more taxing, suppliers must deliver materials of uniformly high quality. With just-in-time delivery, there is no backup inventory to dip into if a newly arrived part is defective.

The most common, and most harmful, mistake U.S. companies have made has been their attitude toward just-in-time delivery. Some companies treat it as a way of getting suppliers to hold inventories for them. Manufacturers who take this approach typically leave it to their suppliers to decide how to deliver materials "just in time," usually under the threat of losing the manufacturer's business if the supplier doesn't comply.

For the just-in-time method to work, however, suppliers need a lot of handholding from their customers. They need plenty of advance notice of what and how much to make, and customers must stick to their schedules. When customers help suppliers get on a just-in-time footing with *their* suppliers, inventories disappear throughout the manufacturing chain, along with their carrying costs.

If, on the other hand, inventory is simply pushed down to someone else in the chain, the cost of carrying it is eventually pushed back onto the customer.

SUCCESS STORIES. The U.S. companies that have enjoyed the greatest success with just-in-time delivery typically went through an arduous learning process beforehand. Xerox Corp., for example, pulled a classic "boner" with suppliers when it first attempted to involve its copier division in just-in-time manufacturing three years ago. The company, which owned most of the U.S. copier market in the early 1970s, had lost more than half of its copier business by the early 1980s to cheaper, better-quality Japanese machines. It then began a rigorous program to improve quality and to win back market share. It slashed its number of suppliers from more than 5,000 to just 300. It gave the survivors two- and three-year contracts—long-term contracts by the standards of

TABLE 1: **What "just-in-time" is not.**

- A transfer of inventory from box user to box producer
- An easy way out
- Self-supporting in its own right
- C.A.P. ("call and pray") or J.I.C. ("just-in-case")

Stevenson is president of SAS International Inc., a Cincinnati, Ohio-based consulting firm specializing in the containerboard/corrugated box industry. This article is adapted from a presentation to the April 1987 Fiber Box Assn. conference.

the copier industry—in return for big improvements in the quality of parts delivered.

But Xerox ran into trouble because of its attitude. From the beginning, the company viewed just-in-time delivery as an inventory reduction program for its own benefit, asking suppliers to hold inventories without compensation. As a result, Xerox's supplier relationships, which had been carefully nurtured over the years, quickly came under strain. Xerox and its suppliers won't discuss the details of the rift, but the lesson Xerox learned was loud and clear: There is no free lunch.

A couple of years ago, Xerox began working to improve its relationships with suppliers. It began reorganizing production, firming up order schedules so that suppliers could make better plans. It also organized classes on just-in-time production to help suppliers train their employees. Today, some Xerox suppliers can't say enough good things about the company.

Another example is Harley Davidson, the only remaining U.S. motorcycle manufacturer. Harley found that Japanese manufacturing techniques were yielding 30% lower operating costs than its own. The U.S. manufacturer attributed most of this difference to three Japanese practices:

- Quality circles
- Use of statistical process controls to ensure high quality
- Just-in-time manufacturing.

The company began to imitate the Japanese in all three areas. It initially made a number of mistakes in establishing new relationships with suppliers, but then it learned from those mistakes. Teams of its buyers and engineers fanned out to visit suppliers; they began simplifying and improving designs and helping suppliers reduce setup time between jobs by modifying equipment to permit quick die changes. To improve the quality of parts, Harley gave its suppliers' employees courses in statistics to help them chart small changes in equipment performance. This practice alerts operators when machines begin to drift out of tolerance.

So far, the results for Harley and its suppliers have been good, although the company has not achieved all of its goals. Thanks to improvements in the quality of its machines, as well as vastly improved manufacturing techniques, its tab for warranty repairs, scrap, and the reworking of parts has been reduced by 60%.

CORRUGATED APPLICATIONS. The examples above do not describe corrugated applications, but the basic principles and requirements are the same. When properly implemented, just-in-time delivery provides a number of benefits to customers. Perhaps the greatest is reduction of their work-in-process inventories, which provides the following advantages:

- Less need for working capital
- Less need for storage space
- Shorter supply lines
- Less labor cost to warehouse inventory
- Less damage, pilferage, and tampering
- Bypassing of intermediate warehousing
- Quicker detection of an out-of-control process.

Because of the attractiveness of these benefits, efforts are quickly growing to apply the just-in-time concept to the corrugated industry, and the concept will likely take hold. From a box maker's viewpoint, however, this is not an easily implemented concept because it requires major changes by both the box maker and the box customer. These include:

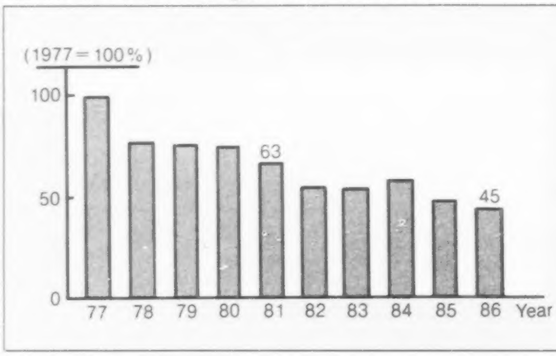
- True commitments by both managements
- Greater quality consistency
- Reliable production, shipping, and delivery
- Quicker response times
- Greater discipline in customer ordering and unloading of delivered products
- Abandoning backup inventories
- Improving communications
- Greater scheduling flexibility
- Ability to make setups cost-effectively
- Greater operator involvement.

INDUSTRY TRENDS/METHODS. The remainder of this article is based on a sampling of what is going on in the U.S. corrugated industry, which already is living with short lead times between order receipt and product delivery. However, we also have had some discussions with European and Japanese corrugated manufacturers and have discovered a growing use of the just-in-time concept there as well.

More and more box users are demanding just-in-time delivery of all material supplies, including packaging materials. Inherent in this policy is the goal of reducing in-plant inventories. Box makers are making use of several methods to meet these demands, including:

1. Moving inventory back to the box plant
2. Moving inventory to an outside warehouse closer to the customer's plant
3. Using options 1 or 2, but with reduced quantities,

FIGURE 1: **Trend of corrugator order size (1977-86).**



by accepting shorter runs

4. Minimizing the need for backup inventory through effective quality and process control.

These options are listed in order of increasing difficulty but also of increasing payoff.

But just-in-time delivery is not a stand-alone system. It is a value-added service that simply will not work unless the box plant reliably produces and delivers a quality product. The most common way of ensuring this is implementation of statistical quality control (SQC) and statistical process control (SPC) procedures.

Once these procedures are functioning properly, just-in-time delivery is a natural next step. However, it still imposes some cost burdens on the box plant, even if the plant is equipped to run short orders in a cost-effective manner. The continuous-run corrugators, shorter setup times, and one-step converting operations that have been developed over the past decade partially offset these costs for manufacturers who have invested in these new technologies.

The Japanese corrugated industry was in a good position to implement the just-in-time concept because it was already required to deliver exact quantities of each order (i.e., zero overrun or underrun tolerances). Consequently, every order was run on the corrugator by itself and lineal waste was rigidly controlled. This is a primary reason for Japan's leadership in the development of the continuous-run corrugator.

FIGURE 2: **Trend of converting order size (1977-86).**

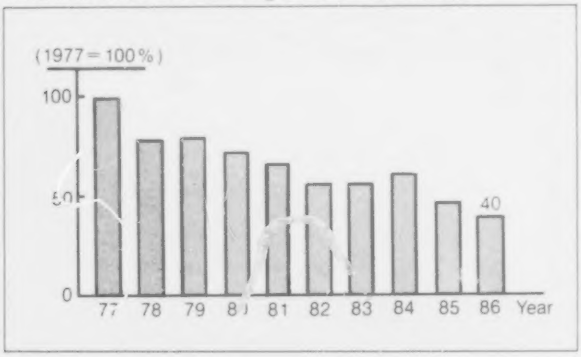
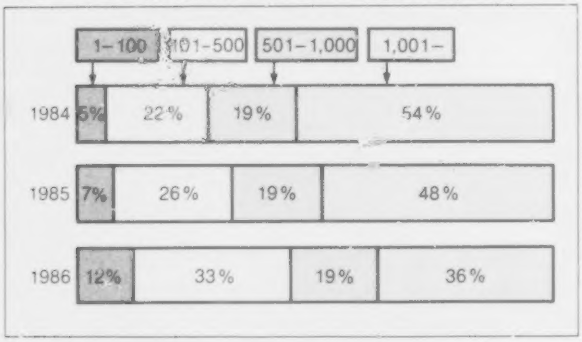


FIGURE 3: **Recent trend of box order size (1984-86).**



With self trimming and continuous run, it becomes economical to run each order on the corrugator as it is needed, thus cutting down on work-in-process inventories. This shortens supply lines and response times, key requirements of the just-in-time concept.

A presentation was made at the January 1987 ICCA session in Australia on the reductions in order size caused by just-in-time delivery in Japan. It noted a significant decline in corrugator order size over the last ten years (Figure 1) and an even more rapid decline in converting order size (Figure 2). These changes are reflected in large increases, in the last three years, in box orders of 500 boxes or less. Such increases came entirely at the expense of orders of more than 1,000 boxes (Figure 3). Finally, the presentation noted the short lead times that now exist in Japan. Only 40% of all orders have lead times of more than three days (Figure 4).

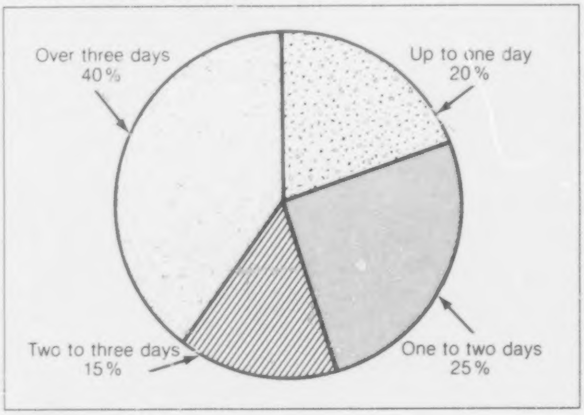
However, the presentation also showed that Japanese box manufacturers have not been able to overcome the negative effect of just-in-time delivery on production costs. FFG productivity is down 32%, and increases in waste, ink, and delivery costs are also evident.

An opposite approach is taken in some European box plants with 98-in. (2.5-m) corrugators and triple knives. Frequently, orders running on the second and third knives are not needed until days later. Thus, inventories build up in the supply system, counter to just-in-time principles.

One European box manufacturer's approach to just-in-time delivery involves a major capital investment designed to ensure short setup times and reliable production performance. It also involves computer monitoring of the production process and provides the flexibility needed for last-minute scheduling changes. The system also requires faster, more reliable delivery of a quality containerboard.

Also in Europe, a significant decline in the number of pieces per order for flexo folder gluers and platen die

FIGURE 4: **Lead time in 1986.**



cutters was evident in Scandinavia in the first half of the 1980s (Table 2).

We can look for similar trends in the U.S., although only limited information is now available on actual applications of the just-in-time concept in the U.S. corrugated box industry. The most publicized example is that of Eastman Kodak, Rochester, N.Y.

NEED FOR SQC/SPC. One American box plant we are familiar with made the mistake of trying to provide just-in-time delivery without having its process under control. The result was pure disaster.

The box manufacturer tried to sort out bad quality, which caused waste to go way up. Even so, an unacceptable level of defective boxes still were being delivered to the user. To protect the user, the box maker also started carrying safety inventories in its own plant. All to no avail—the box maker lost the account.

This story reaffirms the importance of having effective SQC and SPC procedures in place before adopting just-in-time delivery.

Just-in-time delivery is being demanded by many box users, especially large-volume users with high-speed packaging lines and automatic box forming/closing lines. It generally involves two steps:

1. Reducing the number of suppliers
2. Buying only from suppliers who have an ongoing, effective SQC/SPC program.

Nearly every major integrated U.S. box maker is now involved in SQC/SPC. Most see it as an absolutely necessary step for long-term survival, and many have made use of the basic training programs offered by Philip B. Crosby of PCA Inc., Winter Park, Fla., and the W. Edward Demings Institute for Quality & Productivity at the Univ. of Miami.

Both programs make use of simple statistical procedures to monitor product quality and the manufacturing process. Both place quality control in the hands of the individual machine operator. And both have a proven track record of providing quality assurance.

BROAD APPLICATIONS. To date, efforts to apply just-in-time principles to the corrugated industry have concentrated on finished box inventories. But the amount of inventory and capital tied up in roll stock inventories is much larger. Under normal circumstances, historical roll stock inventory levels in the U.S. have been 6 (±2) weeks of consumption. Based on 1986 consumption rates and a price of $350/ton, the value of this inventory is $847 million, or $1.3 million/corrugator.

TABLE 2: **Oversize trends in Scandinavia.**

Machine	Size	% change in pieces/order 1985 vs 1980
Flexo folder gluer	<94 in.	−13
Flexo folder gluer	94-116 in.	−24
Flexo folder gluer	>116 in.	−22
Platen die cutter	<63 in.	−18
Platen die cutter	>63 in.	−16

However, a number of box plants now run successfully with less than four weeks of roll stock, and we know of one plant that runs with less than four days. If the standard six-week level could be reduced to four weeks, this would free up $434,000 of working capital per corrugator, which could then be employed elsewhere. In addition, at a conservative cost of 10% annually for capital, storage space, and damage, this could reduce annual costs by $43,000/corrugator.

Without changes in present practices, some increases in operating costs would also result from reducing containerboard inventory, primarily due to increased side trim and upgrading costs. However, these costs can be reduced, if not completely eliminated, by intelligently reducing the number of roll widths. This will increase the percentage of side trim, but it will also increase width utilization and reduce frequency of wet end changes, resulting in increased productivity. This increase is frequently enough to offset increased side trim costs. (In Europe, it is common to use one to three widths, compared with six to ten in the U.S.)

One of the primary reasons for carrying six weeks' inventory is the current lack of a just-in-time philosophy at containerboard mills. Most mills run a given grade about once a month, and box plants must adjust their orders and inventories to fit this schedule. Add transport time from mills to box plants, plus a little safety stock, and you arrive at six weeks.

At the same time, mills are involved in numerous trades—trades that make overall economic sense and thus should be preserved. Such trades also have the potential to help reduce lead times. This assumes a logical scheduling sequence of different weights and grades among trading partners, so that any one grade is always being run in one or more mills. Thus, one supplier's grade cycle could begin on the first of the month, a second supplier's at mid-month. This would reduce ordering lead time and inventories by two weeks.

Should this be attempted? We urge you to give it serious consideration.

Another step toward just-in-time delivery of containerboard would be for mills to maintain warehouses in large consuming areas. Some are doing this already, particularly for their independent customers. And many mills supplying Japan and Europe have found it necessary to establish warehouses to serve these markets.

We believe it is possible to free up at least $250 million in working capital for the U.S. corrugated industry by applying just-in-time principles to the mill/box plant relationship. The opportunity is there. The only question is: Do box makers have the commitment and perseverence to make it happen? ■

WASTE-TO-ENERGY INCINERATION IS NO THREAT TO WASTEPAPER SUPPLY

Survey shows that secondary fiber supply to the paper industry will not be affected, but concern about government flow control remains

By LISA NORTH

In the March 1985 issue of *Pulp & Paper*, the results of a survey on the progress of resource recovery in all 50 states were published. (Resource recovery refers to the recovery of energy or materials from the waste stream.) As densely populated areas within the U.S. have begun running out of room for waste landfills and other concerns about possible groundwater contamination from landfills have surfaced, more waste-to-energy incinerators have started up, offering a solution to a persistent problem.

By incinerating waste, energy can be harnessed, and the total volume of solid waste is reduced significantly. However, the paper industry and others who make use of recyclables have voiced concern that materials recovery is also a viable solution to reducing the amount of waste going into landfills.

At the time of the original *Pulp & Paper* account, it seemed as though waste-to-energy incineration plants, and related government flow control regulations, might threaten future wastepaper supplies. Wastepaper users thought that potentially recyclable wastepaper and paperboard, which constituted approximately 37.1% of municipal solid waste (MSW) according to Franklin Associates Ltd., would be funneled into waste-to-energy plants for incineration.

However, two years later, most of that concern has dissipated. For this current report, another survey of all 50 states was done to determine the status of resource recovery programs in the U.S. today and the compatibility of energy recovery with wastepaper recovery.

CURRENT WASTE-TO-ENERGY SITUATION. Although it requires significant capital expenditure, waste-to-energy incineration is the most modern solution to the limited landfill situation facing the more populated areas of the U.S. Since the 1985 survey, 22 new waste-to-energy plants have started up, while three were shut down. Table 1 contains the results of the 1987 survey, including the number of operating plants in each state and the number of future plants.

The future of waste-to-energy incineration plants was difficult for many public officials to predict. One reason for the uncertainty was the decrease in oil prices, which made the demand for other energy sources low. A second factor that may affect future decisions to construct plants is the recently released (August 1987) Environmental Protection Agency (EPA) report on air emissions from incinerators.

This EPA report outlines findings on hazardous air emissions which come from incineration plants. The combustion facilities will be responsible for ensuring that they are within the guidelines for safe air emissions. The cost of meeting such EPA regulations could become prohibitive for those cities considering waste-to-energy incineration plants.

In addition to the waste-to-energy plants, small modular plants are coming into use by the private sector. Private facilities with onsite incinerators take potentially recyclable materials straight into the incinerators, usually without any opportunity for material recovery.

Such use of waste-to-energy technology often occurs at hospitals and jails, but it is applicable to any large commercial or industrial operation. Fred Iannazzi, Andover International Inc., has attempted to bring this activity to the attention of the paper industry, which he feels should try to work with large generators of OCC (old corrugated containers) and old news in order to recover more of it.

FLOW CONTROL LEGISLATION. Flow control is an aspect of waste-to-energy incineration that is of greatest concern to wastepaper users. According to the American Paper Institute's (API) Rod Edwards, flow control ordinances are not being enforced and therefore are having little impact on the ability to recover paper.

Wastepaper users who offered their views on waste-to-energy incineration said that it presented a problem to them only when plants were oversized and that strict flow control had to be established to bring in enough waste to allow the plant to operate efficiently. According

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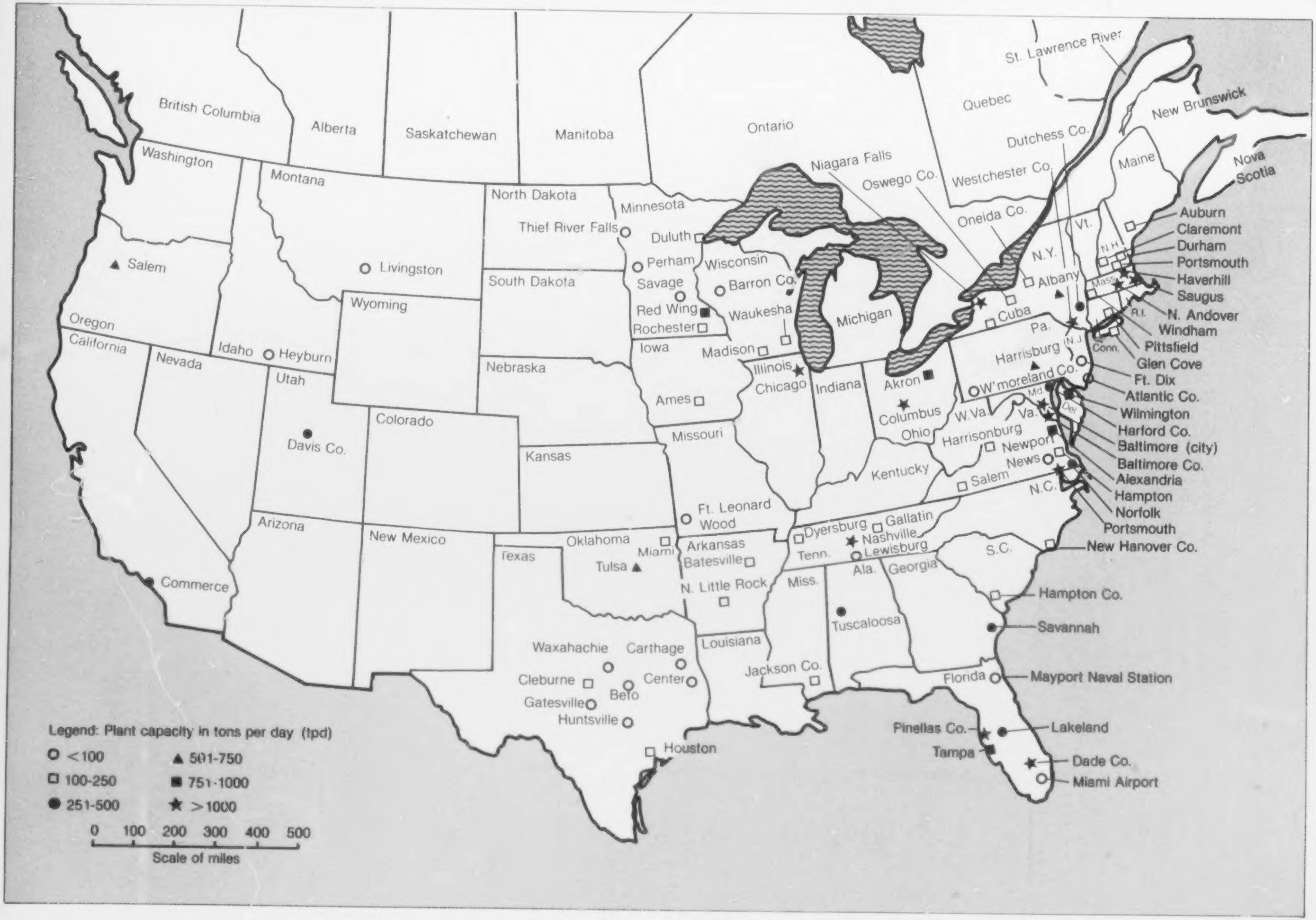
Ms. North was a recent summer intern with Pulp & Paper *from the Univ. of Puget Sound, Tacoma, Wash.*

FIGURE 1: **Operating waste-to-energy plants in the U.S.**


British Columbia
Alberta
Saskatchewan
Manitoba
Ontario
Quebec
St. Lawrence River
New Brunswick
Nova Scotia
Washington
Montana
North Dakota
Minnesota
Maine
Oregon
Idaho
Wyoming
South Dakota
Wisconsin
Michigan
N.Y.
Vt.
N.H.
Mass.
R.I.
Conn.
N.J.
Pa.
Md.
Del.
California
Nevada
Utah
Colorado
Nebraska
Iowa
Illinois
Indiana
Ohio
W.Va.
Va.
Kansas
Missouri
Kentucky
N.C.
Arizona
New Mexico
Oklahoma
Texas
Arkansas
Tenn.
Miss.
Ala.
Georgia
S.C.
Louisiana
Florida
Salem
Livingston
Heyburn
Davis Co.
Commerce
Thief River Falls
Duluth
Perham
Savage
Red Wing
Rochester
Barron Co.
Waukesha
Madison
Ames
Chicago
Akron
Columbus
Ft. Leonard Wood
Miami
Tulsa
Batesville
N. Little Rock
Waxahachie
Carthage
Cleburne
Center
Belo
Gatesville
Huntsville
Houston
Jackson Co.
Tuscaloosa
Dyersburg
Gallatin
Nashville
Lewisburg
Niagara Falls
Oswego Co.
Westchester Co.
Dutchess Co.
Oneida Co.
Albany
Cuba
Harrisburg
W'moreland Co.
Harrisonburg
Newport
News
Salem
Auburn
Claremont
Durham
Portsmouth
Haverhill
Saugus
N. Andover
Windham
Pittsfield
Glen Cove
Ft. Dix
Atlantic Co.
Wilmington
Harford Co.
Baltimore (city)
Baltimore Co.
Alexandria
Hampton
Norfolk
Portsmouth
New Hanover Co.
Hampton Co.
Savannah
Mayport Naval Station
Lakeland
Pinellas Co.
Tampa
Dade Co.
Miami Airport
Legend: Plant capacity in tons per day (tpd)
○ <100
□ 100-250
● 251-500
▲ 501-750
■ 751-1000
★ >1000
0 100 200 300 400 500
Scale of miles

to Franklin Associates Ltd., flow control is defined as "the means by which solid waste can be directed to an energy recovery facility. The objective is to assure that a plant can be financed and will have adequate waste to operate efficiently."

Flow control ordinances vary in their attention to source separation. Some make no exception for recyclable materials, while others encourage or facilitate recycling. Table 1 includes a listing of states that have some flow control ordinances and shows whether or not recyclables (such as paper) are exempt from flow control.

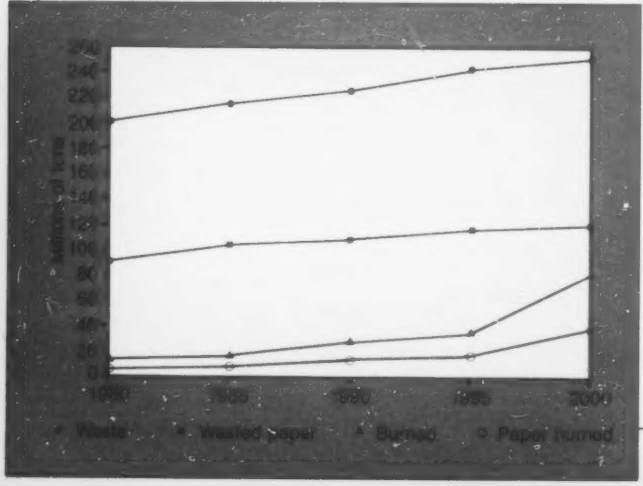
Statewide flow control ordinances referred to in Table 1 give ownership of the waste to the city or county governments, who are then free to institute flow control. Currently, 11 states have legislation which addresses flow control and delegates the ability to establish it to the city or county governments. Cities in 13 other states have instituted local flow control in connection with their resource recovery facilities, although no state ordinance specifically addresses the issue.

Of the 11 states which allow local governments to enact flow control, nine of them include an exemption for recyclables (including paper): California, Connecticut, Florida, Georgia, Maine, New Jersey, Rhode Island, Utah, and Virginia. New Jersey and Rhode Island have mandatory recycling legislation (see sidebar on mandatory recycling).

How have these nine states incorporated recycling into their flow control legislation? The state ordinances for California, Florida, Maine, Minnesota, Utah, and Washington allow for local flow control to waste-to-energy plants not including that portion of the MSW that is recyclable. Connecticut is moving toward a mandatory recycling program and hopes to recycle 25% of the MSW by 1991. In Maryland, Montgomery County has instituted a policy of mandatory recycling of residential newspapers, which are collected and sold to Garden State Paper. State office buildings in Maryland are also recycling paper.

In Georgia and New York, according to state law, flow control must not hinder source separation or recycling efforts. In the two areas of Oregon where flow control has been enacted, there is weekly or monthly curbside collection of recyclable materials. Pennsylvania operates curbside collection programs for newsprint and more than 350 drop sites for recyclables. In Vermont, only nonrecyclables go to waste-to-energy incinerators.

FIGURE 2: **Revised outlook for paper burned in waste-to-energy plants.**



Overall, flow control has not grown into the "monster" that wastepaper consumers had feared it would. For the most part, city and state governments do not plan to get in the way of separation efforts.

THE WASTEPAPER MARKET. According to Edwards of the API, recent high tipping fees at landfills and waste-to-energy plants have provided an incentive to recycle, thereby increasing the supply of wastepaper. He also predicted a growing increase in wastepaper demand. According to API data, consumption of wastepaper at U.S. paper and paperboard mills rose from 16,850,055 tons in 1985 to 17,887,743 tons in 1986. Final figures for 1987 are not yet available, but a similar increase in consumption is expected. Approximately 200 U.S. mills rely exclusively on wastepaper products.

Another factor increasing the demand for wastepaper is the export market. API data showed an increase in wastepaper exports from 3,285,926 in 1985 to 3,748,711 in 1986. Nearly 5 million tons will be exported in 1987. Wastepaper being exported includes cardboard, newspapers, and assorted office paper.

WASTEPAPER MILLS AND DEALERS. The position of the paper industry has changed very little since the 1985 article on waste-to-energy. The industry is still supportive of waste-to-energy incineration as a means of resource recovery. However, the API, on behalf of the industry, has requested that state solid waste management plans address the issue of recycling. With nine of the eleven states that have flow control ordinances exempting recyclables from their flow controls, these requests seem to have been acknowledged, and the concern over flow control is diminishing.

The consensus among the five largest wastepaper-consuming paper companies was that waste-to-energy and recycling are compatible. Federal Paper Board Co., Fort Howard Paper Co., Garden State Paper Co., Jefferson Smurfit Corp., and Sonoco Products Co. were all asked if waste-to-energy incineration plants were inhibiting the wastepaper supply. The response was a unanimous "No." Blake Boyd Jr. of Sonoco expressed the feelings of many when he said that "we were very concerned at first but have discovered they (waste-to-energy plant operators) are usually willing to work with us."

Wastepaper dealers are relatively unconcerned about waste-to-energy plants. These operations would pose a threat only if incineration skyrocketed and no recycling efforts were allowed. Their worry is not that supply might be limited by flow control, but instead that supply will increase from mandatory recycling programs. ■

TABLE 1: **Revised enumeration of waste-to-energy activity.**

State	**# Operating waste to energy plants**	**Total capacity of the plants (tpd)**	**Future plants (through yr. 2000)**	**Statewide resource recovery plan**	**Year statewide plan enacted**	**Does plan address recycling?**	**Total MSW generated in state (tpd)**	**Wastepaper consuming paper mills**	**Mills' wastepaper consumption (tpd)**	**Towns with operating plants**
Ala.	1	300	3	N	—	—	8,000	6	1,076	Tuscaloosa
Alaska	0	—	0	N	—	—	2,000	0	0	
Ariz.	1	25	0	N	—	—	8,750	1	750	(Hospital)
Ark.	2	150	n.a.	N	—	—	5,897	2	194	Batesville, N. Little Rock
Calif.	1	300	6	N	—	—	97,200	10	2,380	Commerce
Colo.	0	—	0	Y	1983	N	9,500	0	0	
Conn.	1	108	8	Y	1985	Y	7,293	2	300	Windham
Del.	1	1000	n.a.	Y	1976	N	1,848	0	0	Newcastle
Fla.	6	7,408	12	Y	1986	N	27,500	2	120	Dade Co., Miami, Mayport, Lakeland, Pinellas Co., Tampa
Ga.	1	500	0	N	—	—	12,000	4	1,025	Savannah
Hawaii	0	—	1	Y	1983	N	2,200	0	0	
Idaho	1	50	3	Y	1982	N	2,740	0	0	Heyburn
Ill.	1	1200	1	Y	1986	Y	30,680	3	267	Chicago
Ind.	0	—	1	Y	1980	Y	68,493	5	1,410	
Iowa	1	160	n.a.	Y	1987	N	5,205	1	50	Ames
Kans.	0	—	3	N	—	—	4,657	2	305	
Ky.	0	—	n.a.	N	—	—	8,767	1	225	
La.	0	—	1	Y	1980	—	—	4	370	
Maine	1	200	3	N	—	—	2,000	1	130	Auburn
Md.	3	2,060	3	Y	1977	Y	17,000	0	0	City of Baltimore, Smith Is., Baltimore Co.
Mass.	4	3,840	3	Y	1985	Y	16,400	4	345	Sangus, Haverhill, N. Andover, Pittsfield
Mich.	0	—	4	Y	1979	Y	32,000	9	1,945	
Minn.	7	1,585	11	Y	1984	Y	10,000	0	0	Thief River Falls, Rochester, Perham, Duluth, Savage, Red Wing (2)
Miss.	1	150	n.a.	N	—	—	3,200	2	173	Jackson Co.
Mo.	1	75	n.a.	N	—	—	n.a.	3	255	Ft. Leonard Wood
Mont.	1	75	3-5	Y	1976	N	1,400	0	0	Livingston/Park County
Nebr.	0	—	1	N	—	—	4,657	0	0	
Nev.	0	—	2	N	—	—	2,250	0	0	
N.H.	3	550	2	Y	1981	N	1,600	4	154	Claremont, Durham, Portsmouth
N.J.	2	200	17	Y	1985	Y	26,000	6	1,660	Ft. Dix, Atlantic Co.
N. Mex.	0	—	1	N	—	—	2,440	0	0	
N. Y.	8	6208	14	Y	1987	Y	48,000	11	1,410	Glen Cove, Westchester Co., Dutchess Co., Albany, Oneida Co., Oswego Co., Cuba, Niagara Falls
N.C.	1	200	3-5	N	—	—	16,000	1	25	
N.Dak.	0	—	0	N	—	—	1,305	0	0	
Ohio	2	4,200	n.a.	N	—	—	27,400	8	962	Columbus, Akron
Okla.	2	500	0	N	—	—	5,000	2	340	Miami, Tulsa
Ore.	1	550	1	N	—	SRP[1]	5,500	6	1,700	Salem
Pa.	2	770	10	Y	1982	Y	25,000	7	360	Harrisburg, Westmoreland Co.
R.I.	0	—	4	Y	1986	Y	2,740	0	0	
S.C.	1	225	1	N	—	—	6,125	3	1,340	Hampton Co.
S.Dak.	0	—	2	N	—	—	1,500	0	0	
Tenn.	4	1,420	0	N	—	—	n.a.	5	1,260	Nashville, Lewisburg, Gallatin, Dyersburg
Texas	8	430	6-7	Y	1983	N	41,000	4	845	Center, Carthage, Cleburne, Gatesville, Beto, Waxahachie, Houston, Huntsville
Utah	1	400	3	N	—	—	4,165	0	0	Davis Co.
Vt.	0	—	2	Y	1987	Y	975	2	59	
Va.	7	2900	10	N	—	—		5	1,030	Salem, Harrisonburg, Ft. Eustis, Norfolk, Hampton, Portsmouth, Alexandria
Wash.	0	—	3	Y	1970	Y	12,054	1	30	
W. Va.	0	—	1	N	—	—	4,200	0	0	
Wis.	3	455	25	Y	1986	Y	10,130	14	1,833	Barron Co., city of Waukesha, Madison
Wyo.	0	—	0	N	—	—	n.a.	0	0	

1. SRP = separate recycling program.
n.a. = not available; Y = yes; N = no; Co. = County.

PULP & PAPER

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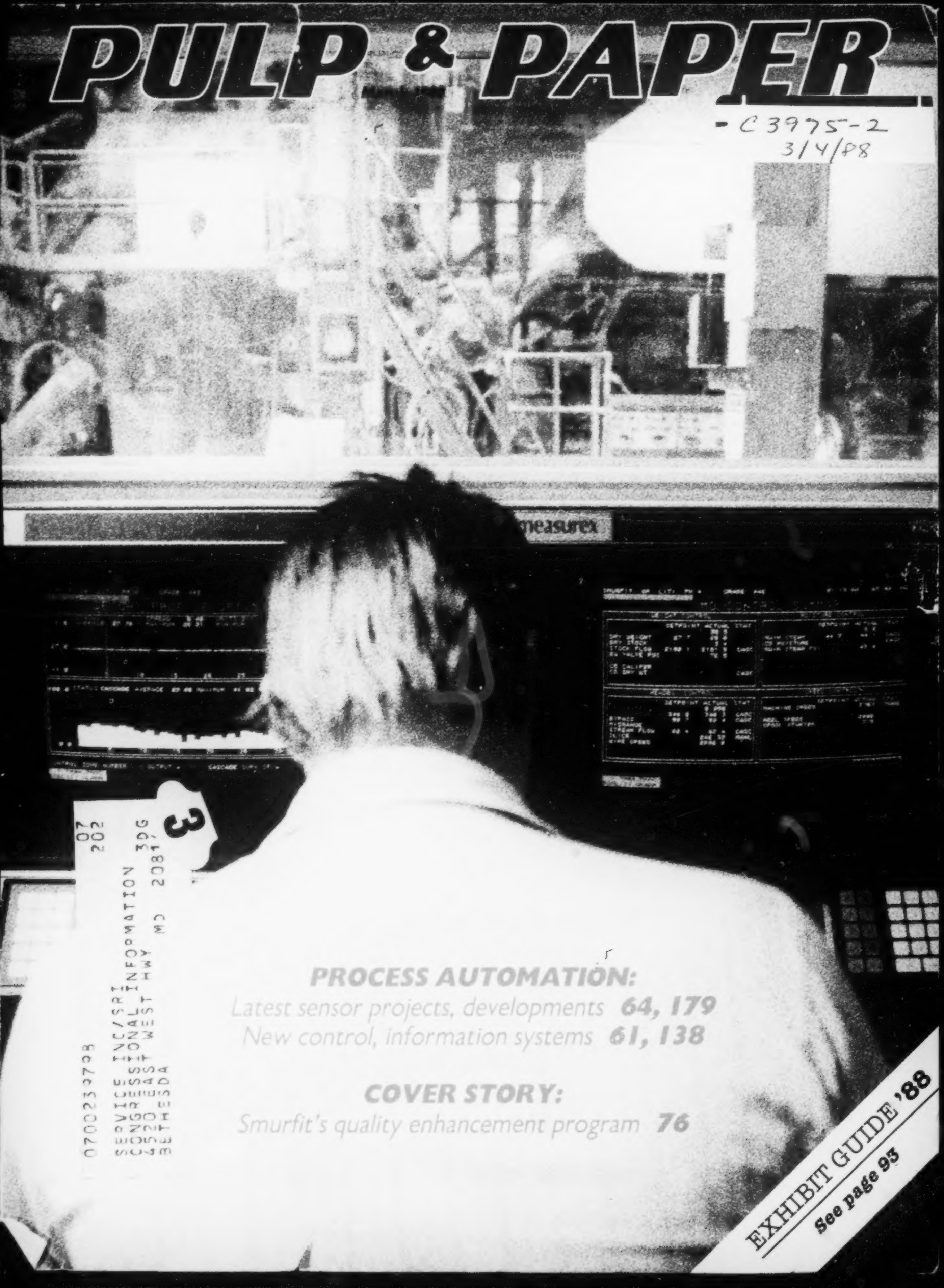

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MARCH

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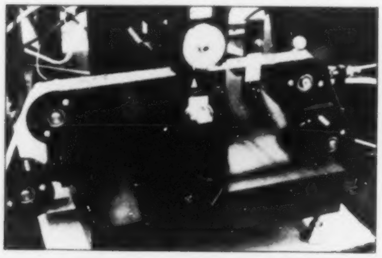

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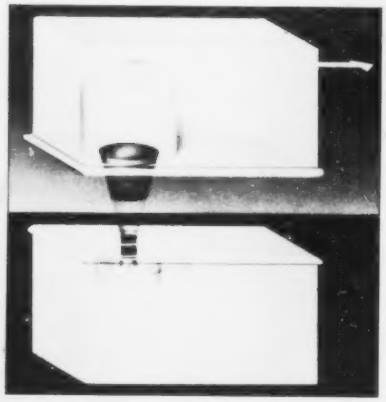

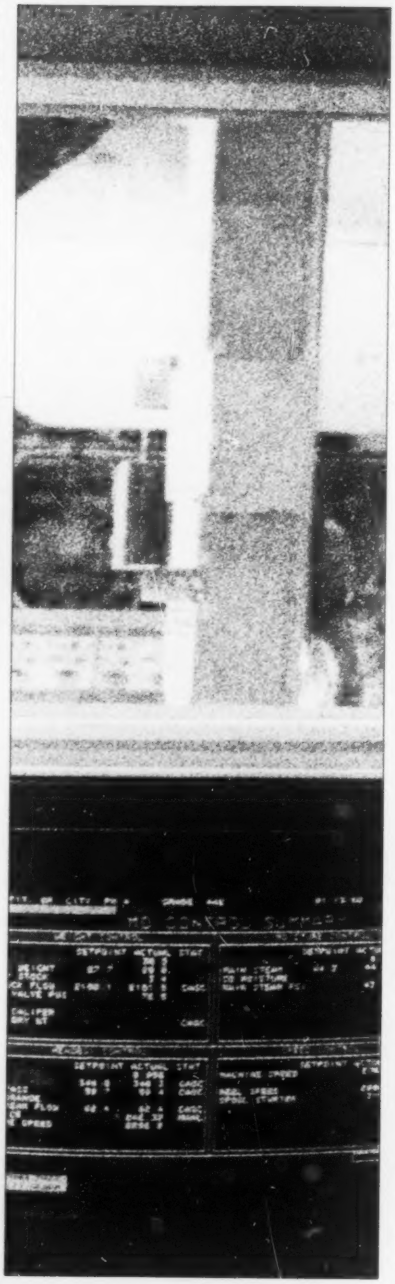

THE COVER

Smurfit Newsprint's Oregon City, Ore., mill is using the latest control technology to assure quality production. **(Photo courtesy of Measurex Corp.)**

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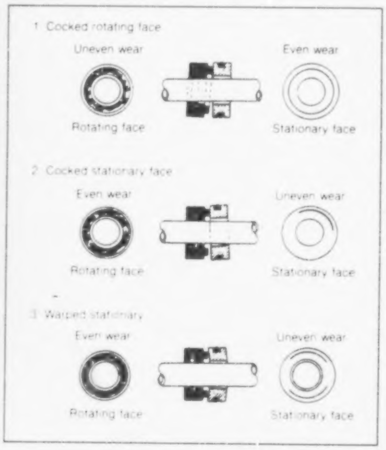
1 Cocked rotating face
Uneven wear
Even wear
Rotating face
Stationary face
2 Cocked stationary face
Even wear
Uneven wear
Rotating face
Stationary face
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Even wear
Uneven wear
Rotating face
Stationary face

PULP&PAPER

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News, Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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Subscriptions & Address Change: Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of $60.00 a year in the U.S. All subscriptions to other countries: $80.00 a year, except Europe and Mediterranean, $90.00 (air service included). Single copy, $6.00, except Buyers Guide, $30.00. Photocopies of articles and complete microform volumes available through University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106.

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Circulation Department, PULP & PAPER,
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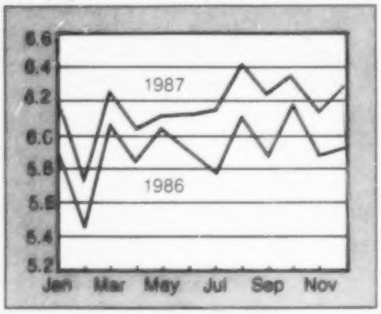
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.3 million tons in December 1987, up 7.0% from the same month in 1986, according to the American Paper Institute. Production set a new record in 1987, rising 5.1% over 1986 and finishing the year at a record 74.5 million tons, equivalent to 95% of reported capacity. Paperboard posted a final total of 37.5 million tons for the year, up 5.9% from 1986. Paper was also strong, rising 4.3% to finish the year at 37.0 million tons.

Among major grades, printing and writing papers were mainly responsible for the increase in paper output, with coated paper up 9.7% from 1986 and uncoated free-sheet up 5.5%. Strong shipments are expected to continue into 1988, thanks to a strong backlog of unfilled orders, API said. In the paperboard sector, record fiber box shipments boosted containerboard production for domestic use up 7.5% from 1986.

Canadian newsprint shipments ended the year at 9.8 million metric tons, up 4.9% from 1986. Operating rates reached 97% for the year, up from 94% in 1986. Woodpulp shipments also finished the year strongly, rising 4.9% from 1986. Operating rates jumped to 95%, up from 91% the previous year. ■

PAPER & PAPERBOARD PRODUCTION[1]

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
Newsprint	Dec.	499	5.7	5,842	3.8
Uncoated groundwood (s)	Dec.	110	-11.3	1,491	-3.2
Coated paper (s)	Dec.	592	9.6	6,869	9.7
Uncoated free sheet (s)	Dec.	960	9.0	10,983	5.5
Other printing/writing	Dec.	122	13.0	1,407	1.7
Total packaging and other paper (s)	Dec.	418	-1.4	5,055	-1.2
Tissue	Dec.	475	12.8	5,341	4.8
Total paper	**Dec.**	**3,177**	**7.0**	**36,987**	**4.3**
Unbleached kraft paperboard	Dec.	1,642	7.3	18,889	6.8
Semichemical medium	Dec.	450	2.7	5,605	4.3
Bleached paperboard	Dec.	382	4.7	4,405	3.2
Recycled paperboard	Dec.	691	10.6	8,594	6.3
Total paperboard	**Dec.**	**3,165**	**7.0**	**37,493**	**5.9**
Total U.S. paper and paperboard output	**Dec.**	**6,342**	**7.0**	**74,480**	**5.1**

PULP, WASTEPAPER & FIBER[2]

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
Total U.S. woodpulp production	Nov.	4,812	1.2	59,370	4.4
Market pulp production	Nov.	670	13.0	8,070	7.5
Wastepaper consumption at paper/board mills	Nov.	1,553	10.3	18,391	6.4
Pulpwood consumption (cords)	Nov.	7,401	-3.6	93,583	2.6

CONVERTED PRODUCTS STATISTICS[3]

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
Corrugated box shipments (billion ft²)	Dec.	23.141	5.1	297.430[6]	4.8
Containerboard inventories at U.S. box plants and mills	Dec. 1	2,399	12.4		

INTERNATIONAL TRADE[2]

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
U.S. paper imports (including products)	Nov.	1,113	-1.9	12,565	7.0
Imports of Canadian newsprint	Nov.	728	-5.1	8,639[6]	3.0
U.S. paper exports (including products)	Nov.	398	0.5	5,167	13.6
Exports of unbleached kraft linerboard	Nov.	147	-10.4	2,189	8.4
Exports of woodpulp	Nov.	365	17.0	4,760	7.8
Norscan pulp inventories[4]	Dec. 31	691	-20.6		
Norscan pulp operating rates[4]	Dec.	99%	96%	97%	91%

CANADIAN STATISTICS[5] *(reported in metric tons)*

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
Total newsprint shipments	Dec.	887	8.8	9,756[6]	4.9
Operating rates	Dec.	97%	97%	97%	94%
Inventories held by U.S. consumers	Dec. 31	1,382	8.9		
Other paper/board shipments	Dec.	519	7.0	6,381	6.2
Woodpulp shipments (export only)	Dec.	759	10.0	8,063	4.9
Operating rates	Dec.	90%	87%	95%	91%

1. American Paper Institute 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council 4. North American/Scandinavian paper-grade market pulp 5. Canadian Pulp & Paper Assn. 6. Not annualized (s) = Shipments

Coated free-sheet: Olympics and presidential campaign help buck up markets

Grade structure: Coated free-sheet papers are made from no more than 10% groundwood pulp, most commonly stone groundwood; the balance is chemical pulp. The highest quality coated papers, Nos. 1 and 2, have no groundwood content at all, while Nos. 3 and 4 may contain none or small amounts. Half of No. 4 paper is excluded from the free-sheet category because of groundwood pulp content.

Almost 86% of coated free-sheet paper is coated two-side (C2S). Most of the 420,000 tpy of coated one-side paper (C1S) is free-sheet.

Basis weights for premium coated Nos. 1 and 2 are usually between 60 lb and 100 lb, while Nos. 3 and 4 generally are in the 25-to-90-lb area. About 40% of coated Nos. 3 and 4 fall below 60 lb. Commercial printers use most of the coated free-sheet paper. Major end uses are annual reports, catalogs, and other advertising and promotional materials. Magazines use coated papers for cover stock and higher-grade interior pages in high-quality publications. Magazine publishers use about 10% of the No. 3 grade paper.

Surface finishes on coated papers include glossy, dull, matte, and embossed. Measurements of these finishes (Gardner glossmeter) are 45 or more for glossy, as low as 25 for dull, and 20 or below for matte.

About 85% of all coated paper is glossy. Other projections break down among the grades as: No. 1 is 65% glossy and 25% dull, with a fraction matte and embossed; No. 2 is about 80% glossy and 16% dull; and No. 3 is 63% glossy, 33% matte, and 3% dull. Embossed represents less than 2% of any grade.

Production/capacity: Operating rates in 1987 were about 95%. Shipments of coated free-sheet from U.S. mills rose to about 3.08 million tons, an increase of 10.8% from 1986.

Capacity increased almost 10% in 1987 with additional tonnage at Scott Paper Co.'s S.D. Warren Div. in Skowhegan, Maine—215,000 tpy (brought online at the end of 1986); Westvaco Corp., Luke, Md.—30,000 tons; Mead Corp., Escanaba, Mich.—20,000 to 30,000 tons; and Consolidated Papers Inc.'s Biron Div.—60,000 tons switched from coated groundwood.

Outlook: The paper industry is expected to do slightly better than the economy in general. In 1988, real growth of the GNP is pegged at about 2.0%, slightly lower than the 2.7% in 1987, according to *Blue Chip Economic Indicators*. Coated free-sheet demand probably will grow about 4% to 4.5%.

Economists do not fear a recession in 1988 until the end of the year or, more likely, in 1989. Boosting the coated markets will be advertising for the 1988 Olympics and the U.S. presidential campaign.

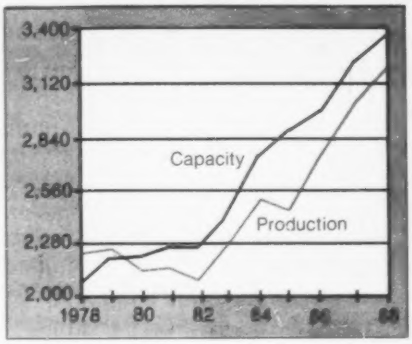
Capacity will rise about 4.8%, with new tonnage coming online in the fall at Midtec Paper Corp.'s Kimberly, Wis., mill (205,000 tpy) and the final 30,000 tpy of a 150,000-tpy expansion at Westvaco Corp.'s Luke, Md., mill. Potlatch is rebuilding its Cloquet, Minn., mill, but the project is not expected to add significantly to the mill's 146,000-tpy capacity. Champion International Corp. recently announced plans to move ahead with installation of a 265,000-tpy coated free-sheet machine at its Quinnesec, Mich., market pulp mill for startup in late 1990.

Prices: Coated free-sheet producers headed into 1988 with their machines running virtually full out, creating an opportune time to raise prices, which began their upswing in mid-1987. A $40 to $50/ton price increase was announced for Feb. 1 on web grades, particularly Nos. 3 and 4. This would bring No. 3 60-lb in rolls to about $1,150/ton. A hike on sheets, especially No. 1, was less certain.

Typical historical pricing trends ($/short ton, average price for year) are as follows for 70-lb No. 1 sheets: 1979, $939; 1980, $1,021; 1981, $1,096; 1982, $1,148; 1983, $1,213; 1984, $1,321; 1985, $1,375; 1986, $1,350; and 1987, $1,410. For No. 3 rolls: 1979, $690; 1980, $750; 1981, $798; 1982, $798; 1983, $830; 1984, $919; 1985, $980; 1986, $940 to $950; 1987, $980.

Markets: Commercial printing remains the largest consumer of C2S paper, while C1S is used primarily by label converters and wrap manufacturers. A substantial minority of No. 4 goes to magazine publishers, as does No. 3, either of which can be used for magazine cover stock. ■

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1986	1987e	1988e
Production[1]	2,781	3,080e	3,219
Capacity[2]	2,944	3,237	3,393
Utilization rate	94.5	95.1	95.0
Imports	100	114	125
Exports	42	52	58
Apparent U.S. consumption	2,839	3,142	3,286
lb/capita	23.58	25.85	26.79
GNP ratio	0.67	0.70	0.69

e = Estimate.

1. P & P estimate.

2. American Paper Institute.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Scott Paper[1]	900	26.5
2. Westvaco	500	14.7
3. Mead Corp.	395	11.6
4. Simpson	290[2]	8.5
5. Champion	285[2]	8.4
6. Consolidated	270[2]	8.0
7. Potlatch[3]	270	8.0
8. Midtec	177	5.2
9. Newton Falls	100	2.9
10. Boise Cascade	75	2.2

Market share of top five companies:
69.7%

Market share of top ten companies:
96.0%

Total U.S. capacity (1988):
3.393 million tons

1. S.D. Warren Div.

2. *P & P* estimate.

3. Northwest Div., production.

SALES & EARNINGS

Profits jumped 46% on 20% increase in sales

The U.S. pulp and paper industry will look back on 1987 as one of the most profitable years in its history. Earnings for the year surged 45.8% on a 19.7% increase in sales. The profit surge was a reflection of strong demand that resulted in full capacity operation and price increases in most grade segments. Industry cost cutting measures and productivity improvement programs implemented over the last several years also contributed to the increase.

"A major external factor affecting sales and earnings favorably in 1987 was the decline of the dollar in relation to other major currencies," noted Weyerhaeuser Co. chairman and CEO George H. Weyerhaeuser. "Sharply higher dollar prices of pulp and paper products traded in the world markets drove margins for these products to their highest levels in the 1980s," he told shareholders of Weyerhaeuser Co.

Most of the paper industry executives are bullish on at least the first half of 1988, due to the current momentum seen in the industry. Mills are operating virtually at capacity in many grades, inventories are at moderate to low levels, and many of the price increases that were announced for the first quarter appear likely to hold.

In addition, companies this year will also be benefiting from the price increases that were implemented on the majority of grades in the second half of 1987 and from lower tax rates. As George Adler, an industry analyst with Smith Barney Harris Upham Co., puts it, "Price cutting [in a possible recession] would have to be very severe in order for paper companies to earn less in 1988 than they did in 1987."

G-P still No. 1. With sales of $8.6 billion, Georgia-Pacific Corp. had the highest sales in the industry. Earnings for the year amounted to $458 million, a 55% increase, which set a record for the company. Chairman and CEO T. Marshall Hahn Jr. commented, "Demand for pulp and many paper and board products allowed us to operate our mills at or near capacity for most of the year. Strong demand for linerboard and uncoated free-sheet and our expanded capacity in these products contributed substantially to profitability."

International Paper Co. showed a 33.4% increase in earnings on a 42% increase in sales. Earnings for the quarter were 10.6% above the year-earlier level. The effect of the ongoing strikes at three of IP's mills and a lockout at another mill is reportedly diminishing.

James River Corp. ended its second quarter on Oct. 25 with a 48% increase in profits. The company noted

TABLE 1: **Most forest products companies enjoyed healthy earnings in 1987.**

	Full year ($000)			
Paper companies	**Sales**	**Change 1987/86**	**Earnings**[1]	**Change 1987/86**
Boise Cascade Corp.	$3,820,810	2.2%	$182,990	80.2%
Bowater Inc.	1,231,002	33.8	81,140	64.1
Champion International	4,614,723	5.2	293,321[2]	46.1
Chesapeake Corp.	675,713	12.7	30,153	119.5
Consolidated Papers Inc.	742,835	13.8	95,798	9.4
Federal Paper Board Co.	1,025,727	8.1	65,763[2]	257.2
Georgia-Pacific Corp.	8,603,000	19.1	458,000[2]	54.7
Great Northern Nekoosa Corp.	2,589,000	27.0	200,600[2]	88.3
International Paper Co.	7,800,000	41.8	407,000[2]	33.4
James River Corp. (10/25)[3]	1,236,152	10.8	53,429	47.9
Jefferson Smurfit Corp.	1,099,465	16.4	91,996	228.5
Kimberly-Clark Corp.	4,900,000	14.0	325,000	30.9
Longview Fibre Co. (10/31)	569,399	16.8	65,166	94.6
Louisiana-Pacific Corp.	1,921,600	27.6	125,000[2]	−33.2
Mead Corp.	4,208,800	30.8	218,200[2]	99.6
Mosinee Paper Corp.	215,982	10.5	5,714	22.1
Pentair Inc.	739,245	26.5	21,860	43.6
Pope & Talbot Inc.	426,908	37.6	28,129	77.9
Potlatch Corp.	992,077	1.6	87,623	25.3
Scott Paper Co.	4,122,000	19.9	233,800	25.4
Sonoco Products Co.	1,312,052	36.1	61,482[2]	12.4
Temple-Inland Inc.	1,602,700	23.7	141,400[2]	75.0
Union Camp Corp.	2,307,599	12.8	207,483[2]	57.1
Wausau Paper Mills Co. (11/30)[3]	68,884	10.5	3,736	25.5
Westvaco Corp. (10/31)	1,903,606	5.1	146,191[2]	35.2
Weyerhaeuser Paper Co.	6,989,829	23.6	446,623	61.4
Willamette Industries Inc.	1,431,624	19.3	121,339	62.5
Total	**[illegible]**	**19.7%**	**$4,141,771**	**45.8%**

n.m. — Not meaningful.

1. Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.

2. **Champion International:** 1987 earnings exclude a net gain of $88.7 million from the sale of investments in Stone Container Corp. and U.S. Plywood Corp. **Federal Paper Board:** Year net includes $8.2-million after-tax charge for retirement of debt. Year-earlier net for quarter and year include $15.1-million charge for debt retirement. **Georgia-Pacific:** 1987 net income includes a $66-million pretax gain from sale of investments in Georgia-Gulf Corp., and 1986 earnings include a $33-million pretax gain for the same reason. **Great Northern Nekoosa:** 1986 net excludes a net charge of $21.2 million from restructuring. **International Paper:** 1986 net income for quarter and year includes pretax gains totaling $73 million partly offset by a pretax charge of $31 million from relocations and plant closing costs. **Louisiana-Pacific:** Year-ago net for quarter and year includes a $123.0-million pretax credit from the reversal of income taxes. **Mead:** 1986 net excludes $65.9-million charge from discontinued operations. **Sonoco Products:** Net for 1987 year and quarter includes a $10-million pretax charge related to consolidation costs. **Temple-Inland:** 1987 includes gain on property and equipment of $4.1 million. 1986 includes $4.5-million gain for same. **Union Camp:** 1986 year and quarter exclude a $5.1-million net gain on sale of a facility and a $3.0-million net charge from repurchase of debt. **Westvaco:** 1987 year and quarter net includes a $12.4-million credit from sale of timberlands.

3. Results are for quarter only and are not included in total.

that earnings increased in tissue, disposable food service, and paperboard packaging but that they were flat for communication papers and were lower in specialty papers and flexible packaging.

Paperboard profits surge. Profits of companies heavily involved in containerboard and bleached board increased dramatically. Jefferson Smurfit Corp. reported that its net income for the year more than tripled to $92 million for the year on sales of $1.1 billion. Smurfit's equity in Container Corp. of America, its 50%-owned affiliate, amounted to $44.5 million in 1987, reflecting cost reduction programs as well as improved market conditions.

Union Camp Corp.'s profits surged 59.7% for all of 1987 to $207.5 million on sales of $2.3 billion. Strong demand and prices for linerboard as well as improving markets for white papers were behind the strong results. Federal Paperboard Co.'s income jumped 120% to nearly $74 million for 1987 before an extraordinary $8.2-million charge from retirement of debt.

Publication papers prosper. Some makers of publication papers got off to a slow start in 1987, although most of them finished the year with earnings that were more than satisfactory. Mead Corp. came close to doubling its earnings for the year. The company said that its pulp mills have been sold out since mid-1987. Mead said that prices for coated and uncoated paper began to recover in the second half and demand for carbonless copy paper remained strong throughout the year.

Boise Cascade Corp. almost doubled its 1987 earnings. Bowater Inc. additionally reported record sales and earnings for the year. The company attributed the good showing to a recovery in newsprint prices and also to two price increases on coated paper that were implemented during the second half as new capacity was fully absorbed.

Tissue profits rise. For the first time in the company's history, Scott Paper Co.'s 1987 sales passed $4 billion, and earnings of $233 million also set a record. Scott said that its operating results in Europe were "excellent" but that earnings of its sanitary papers business in the U.S. showed little growth because of the extremely competitive environment of the market place. ■

EXPANSIONS

Weyerhaeuser studying pulp expansion at Columbus mill

Weyerhaeuser Co. is studying the feasibility of building a kraft pulping facility at its lightweight coated paper mill in Columbus, Miss. If constructed, the addition probably would produce approximately 1,150 to 1,200 tpd, with almost 1,000 tons available for sale.

Columbus currently has a 220-tpd thermomechanical pulp mill and a 500-tpd paper machine that started up in 1982. Needed chemical pulp is transferred from other company mills or is purchased. If approved in the first half of this year, the pulp mill could come onstream in 1990. The original three-phase plan for Columbus was to add a kraft pulp mill plus an uncoated free-sheet machine to be followed later by a second coated groundwood paper machine. The latter two stages were indefinitely postponed in 1982 due to unfavorable economic conditions, but some of the infrastructure work for them was completed. ■

F.F. Soucy to rebuild groundwood machine

F.F. Soucy Inc. et Associes is rebuilding its No. 2 newsprint and groundwood papers machine at Rivières-du-Loup, Que., boosting capacity by 20,000 metric tpy. In addition, the C$57.3-million project includes improvements to the thermomechanical pulp (TMP) mill and woodroom. These projects are slated for completion in late 1988.

Additional projects slated to come online in 1989 include the replacement of the fourdrinier on No. 1 newsprint machine, which with other improvements will add 4,000 tpy. This $3-million project will be completed in September 1989. No. 1 machine is scheduled to be shut down for only two working days, taking advantage of the New Year's shutdown period in 1988/89.

The company also is considering a plan to rework No. 1 press section and is installing a new pickup combination press, adding 9,000 tpy. This project would cost about C$7 million and would be completed in September 1991.

The rebuild of No. 2 newsprint/groundwood machine will increase speed to 4,000 fpm. Currently, No. 2 capacity is about 400 to 410 metric tpd. No. 2 produces mostly newsprint, along with small amounts of high-brightness news and 22.5-lb directory paper.

New equipment includes both a Valmet-Dominion hydraulic headbox and twin-wire former as well as a Tri-Vent press section. No. 2 will be shut down in August and will restart after Labor Day, said mill spokesman Jean-Luc Gaudreau. The TMP mill will get new screening and cleaning systems. These projects will cost about C$35 million. Cowan Lovalin Inc. is engineering the No. 2 rebuild and the TMP improvements. ■

Champion to build new coated free-sheet machine

Champion International Corp. is set to move ahead with construction of a 265,000-tpy coated free-sheet paper machine at the company's new pulp mill in Quinnesec, Mich. The decision to go ahead was made after the company was able to resolve issues of taxation and environmental permits with government agencies.

Installation of the Beloit machine will begin in the spring of 1989 with startup likely in late 1990, a company spokesman said. No. 41 machine will have a 280-in. trim and will be able to run at speeds up to 3,500 fpm. In addition to the paper machine, the company will install two coaters but no sheeting equipment, since paper will be sold in rolls. Employment at the mill will be increased by about 100 workers.

The machine will use less than half of the mill's production of 750 tpd of bleached hardwood kraft pulp. The majority of the remaining pulp will be available for sale on the open market. ■

K-C to install another new machine at Neenah

Kimberly-Clark Corp. announced its plans to install a 30,000-tpy paper machine at its Neenah Paper Div.'s mill in Whiting, Wis. The project would cost $25 million and would increase capacity by about 25%, according to K-C chairman and CEO Darwin E. Smith.

This follows the installation of a

PRODUCTION

Canadian paper industry set output record

Total shipments of pulp and paper increased 5.2% to a record 24.2 million metric tons in 1987, according to the Canadian Pulp & Paper Assn.'s year-end statistics. The Canadian industry's stellar performance was boosted by the strong worldwide demand and the high prices for pulp, newsprint, and printing/writing papers. The industry as a whole operated at 98% of capacity.

Market pulp shipments rose 4.9% to 8.1 million tons. Most of the market pulp produced in Canada is exported, thus making Canada the world's largest market pulp supplier. The U.S. is by far the major export market, accounting for 3.6 million tons. Canada is the main foreign supplier to the U.S., with about 25% of pulp shipments going directly to subsidiary and affiliated companies in the U.S.

Strong U.S. demand and new capacity in Canada contributed to a 43% gain in shipments of book and writing papers to U.S. customers. Shipments of book and writing papers to the U.S. totaled 404,00 tons last year, up from 283,000 tons in 1986 and only 227,000 tons in 1984.

Shipments to U.S. jump. Modest gains were posted for kraft linerboard shipments, which increased 2.6%, boxboard shipments, up 2.6%, kraft paper shipments, up 2.4%, and tissue shipments, up 1.1%. On an international scale, Canadian producers are less competitive in these grades and sell most of their output in the domestic market.

Canadian exports of some of these packaging grades to the U.S., however, have jumped sharply over the past several years, partly due to tight U.S. supply. For example, Canadian exports of kraft paper last year totaled 165,000 tons, up from 134,000 tons in 1985 and only 55,000 tons in 1984. Containerboard shipments to the U.S. have also been on the rise, hitting 181,000 tons in 1987, up from 165,000 tons in 1986 and 98,000 tons in 1985.

In 1987, the weak Canadian dollar contributed to the industry's competitiveness vis-à-vis Scandinavian and U.S. producers, leading to a 5.8% gain in total export shipments. The rising value of the Canadian dollar against the U.S. dollar in the first months of 1988, however, will hurt producers. ■

TABLE 2: **Canadian exports increased 5.2% in 1987.**

Canadian pulp/paper/paperboard shipments
(000 metric tons)

	1984	1985	1986	1987
Woodpulp[1]	6,700	7,008	7,684	8,063
Newsprint	9,018	8,986	9,302	9,756
Uncoated groundwood	907	1,040	1,219	1,338
Book and writing	1,022	1,081	1,176	1,314
Tissue and specialty	403	455	467	472
Kraft papers	426	475	549	562
Boxboard	738	703	725	744
Linerboard	1,085	1,137	1,223	1,255
Corrugating medium	607	558	651	696
Total	**20,906**	**21,463**	**22,996**	**24,200**
% change	**5.5%**	**2.6%**	**7.2%**	**5.2%**

1. Does not include domestic paper-grade pulp shipments.
Source: Canadian Pulp & Paper Assn.

1987 Canadian pulp/paper/paperboard shipments
(000 metric tons)

	Canada	U.S.	Other	Total
Woodpulp[1]	—	3,582	4,481	8,063
Newsprint	1,183	7,086	1,487	9,756
Uncoated groundwood	201	1,059	78	1,338
Book and writing	881	404	28	1,314
Tissue and specialty	408	56	8	472
Kraft papers	243	165	15[illegible]	562
Boxboard	664	78	2	744
Linerboard	931	75	250	1,255
Corrugating medium	477	106	113	696
Total	**4,988**	**12,611**	**6,602**	**24,200**
% of total	**20.6%**	**52.1%**	**27.3%**	**100%**

1. Does not include domestic paper-grade pulp shipments.
Source: Canadian Pulp & Paper Assn.

Daishowa's Alberta mill

At press time, the Alberta government announced that it will spend C$65.2 million for access by rail and road to Daishowa Paper Manufacturing Co.'s planned bleached kraft pulp mill near Peace River, Alta., and the Canadian federal government will spend $9.5 million in order "to facilitate the mill's infrastructure."

Construction on the $500-million project is expected to begin this spring. When completed in 1990, the 340,000-metric-tpy mill will be Canada's largest hardwood market pulp mill. Daishowa estimates that the mill will employ 330 employees, with an additional 300 employed in harvesting local aspen.

While engineering plans were not available, it is known that the mill will use oxygen delignification rather than the traditional kraft bleaching process, which is suspected of producing dioxin in wastewater discharge. "Environmentally, the mill will be the cleanest bleached kraft pulp mill in Canada, and it will also be one of the most pollution-free in North America," said Leroy Fjordbotten, Alberta forestry minister.

Daishowa plans to market most of the mill's output in Japan, and the remainder in the U.S., Europe and Asia, according to Koichi Kitagawa, Daishowa Canada Ltd.'s general manager. H.A. Simons of Vancouver will be the main consultant on the project. Negotiations to procure equipment for the mill plant are to begin immediately. ■

Wastepaper use becoming more attractive; chemicals benefit

Consumption. Wastepaper collection rose 5.5% in 1987 to 23.2 million short tons, mostly boosting exports, while domestic consumption stood at 19 million short tons. Because of the soaring price of market pulp, secondary fiber is becoming an attractive furnish for tissue, newsprint, and some printing and writing grades. Linerboard and corrugating medium producers are also findng it useful as boxboard rules flex and formation technologies improve. The falling dollar has greatly influenced the export scene, particularly along the Pacific Rim.

North American consumption growth can be attributed to the new projects developed recently. In brown paperstock (OCC, kraft clippings), Temple-Inland Inc., Interstate, Packaging Corp. of America, and Chesapeake Corp. completed projects that consume almost 600,000 tpy. In white paperstock (ledger, book, envelope, etc.), over 1 million short tons is being or will be used to supply Fort Howard Corp.'s two new tissue machines at Rincon, Ga., and new or expanded newsprint machines at Ontario Paper Co. Thorold, Ont.; Stora Forest Industries, Port Hawkesbury, N.S.; Cascades Inc., Niagara Falls, N.Y.; Garden State Paper Co., Garfield, N.J.; Southeast Newsprint, Dublin, Ga.; and Newsprint South, Grenada, Miss.

These expansions, along with the new inks and binders used in advanced printing processes, have made performance of chemicals for dispersion, flotation, and agglomeration a concern of users. Suppliers are focusing on programs and single formulations for these functions. Commodity chemicals have enjoyed only a bit of this heightened interest.

Producers of sodium silicate indicated that markets are improving only slightly ahead of last year, and use in secondary fiber processing is really flat since users are applying it more efficiently. Sodium silicate use in pulp production will grow as a peroxide stabilizer. Caustic use in this area is also flat. The washing process, which is actually more popular in recent expansions, uses more chemical, of which specialty formulations are getting the lion's share. The flotation process, once thought of as the savior from chemicals, seems to be attracting the smaller manufacturers who also turn to formulations for their deinking needs. Conversion to hydrogen peroxide as a bleacher of deinked and mechanical pulps is said to be occurring at a slow but steady pace.

The suppliers of formulations, as programs and under single trade names, expressed enthusiasm about the present market conditions. Many products under development or trial are finally being accepted by users. Although many users continue to hail mechanical treatment as the chief deinking component, the realities of new printing processes and higher sheet quality are giving chemicals a wider proving ground. Consumption is up and will move further in the future.

Suppliers mentioned that new products are coming out, mostly inside already established programs. Buckman Laboratories Inc. achieved great success last year with the "Repulping, deinking test kit," which allows users to check paperstock sources vs chemical demand. The kit helped move Busperse 288, a dispersant, into the market and assisted other older products in gaining more attention. Other product introductions include an ultraviolet-cured ink disperser from Nalco Chemical, a new product line from Reilly-Whiteman for retention and drainage, and process chemicals from Santek Chemicals.

One big area of interest among suppliers and users alike is what to do about laser inks. Users complain that the relatively new inks, used in ink-jet printers and computer printout (CPO) stock, are a chief cause of stickies and spots in finished sheets. There have been many new suppliers claiming to have the answer: Laserbusters, Resin Research Laboratories, Kimberly-Clark, and Dainippon Ink. The known suppliers are also working with deinkers within their product lines.

Availability, price. A few plant startups will expand the availability of chemicals. Horizon Chemicals has opened a plant in Houston, Texas, for surfactants. National Silicates will build a facility in Whitecourt, Alta. Interox plans to generate hydrogen peroxide in Longview, Wash.

In other news of suppliers, Du Pont sold its sodium silicate plants (Augusta, Ga., Fortville, Ind., and Pineville, La.) to Power Silicates of Melbourne, Australia. The U.S. base of Power Silicates is in Claymont, Del., and it will produce 70,000 tpy. Power joins Chemical Products, PQ Corp., and Occidental as the chief merchants of sodium silicate, accounting for over 65% of the 1.25 million short tons produced each year.

Prices of the commodities have moved upward throughout 1987. Caustic prices are approaching or have surpassed the $200/ton level. According to one source, sodium silicate lags behind caustic and soda ash price changes, and, indeed, PQ Corp. effected a 5% increase in the final quarter of last year. It is unlikely that prices will move higher in 1988. Hydrogen peroxide is seen by some as in oversupply, and list prices do not reflect current market rates.

All producers mentioned the competitiveness of specialty products and that each is priced on a very competitive basis. Most dispersants, surfactants, coagulants, etc. run from $1 to $2/dry lb, depending on strength and performance. Suppliers suggested some movement to the upper end of that range, primarily due to the increasing needs of the user. ■

—*Michael Ducey*

TABLE 1: **Consumption and price of chemicals consumed in deinking.**

Chemical	Consumption in recycling (short tons)	Change (1986-87)	Price[1] ($/short ton)
Caustic	13,625	4.0%	0.100[2]
Sodium silicate	11,900	2.5%	0.157[3] 0.666[4]
Hydrogen peroxide	5,700	4.0%	0.3225[5]

1. Source: *Chemical Marketing Reporter.* 2. 50% basis. 3. Anhydrous glass basis. 4. Solution. 5. 50% basis.

MANAGEMENT

FLUFF PULP GROWTH SLOWING DUE TO LOWER BIRTHRATE, SUPERABSORBENTS

Growth of "ultra" diapers hurt demand last year, and further displacement could come from new synthetic fibers

By WILL MIES, Executive News Editor

Fluff pulp demand has been the fastest growing major end use for the U.S. market pulp industry, with consumption rising at about a 7% to 8% average annual rate during the past decade. But in 1987 U.S. consumption was believed to have declined, and domestic demand is expected to show relatively slow growth through the 1990s, due to a number of factors. These include lower U.S. birthrates, the already high penetration of disposables in this country, and the growing use of superabsorbent material in new thinner "ultra"-style baby diapers, which contain less fluff pulp.

As if this were not enough [illegible] materials are being studied that could lead to even further displacement of fluff pulp. Synthetic thermoplastic fibers may be mixed with fluff pulp in the design of even stronger but thinner absorbent pads, baby diapers, and adult incontinence products. And Johnson & Johnson (J&J) plans to process sphagnum moss as a low-cost absorbent material at an idle sulfite pulp mill in Quebec in perhaps the most unusual development of all.

On the positive side, however, fluff pulp producers should enjoy healthy export demand due to increasing use of disposable diapers in Europe, Japan, and many developing countries. And the growing use of adult incontinence products by an aging U.S. population should help offset any loss in fluff demand for use in domestic baby diaper production. Many of these trends affecting fluff pulp were discussed at the recent Insight '87 nonwovens conference in Toronto that was sponsored by Miller Freeman Publications, which publishes *Pulp & Paper* and which recently acquired *Nonwovens World*.

TABLE 1: **Projected U.S. disposable infant diaper unit growth.**

	Market share[1] (%)	Billion usage
1980	60.0	12.2
1985	75.5	16.4
1990	83.9	19.4
1995	90.8	20.0
2000	93.3	19.6

1. Market share is defined as the percentage of the total potential market for diapers if all 30-month infants were to use disposable diapers at the rate of 6.6 changes per day.

Source: Marketing/Technology Service Inc.

SLOWER DIAPER GROWTH. U.S. domestic fluff pulp demand is projected to increase by about 80,000 metric tons from 1987 through the year 2000, according to Kenneth E. Lowe, an author of a new report recently released by Marketing/Technology Service (MTS) of Kalamazoo, Mich. This is a drastic change from the recent past, in which domestic fluff pulp consumption increased by nearly 200,000 tons over the past six years (Table 2).

"Unit demand for infant diapers will increase at a slower rate over the next decade due to lower birthrates and to slower growth in disposable market share," he told the Insight meeting. Currently, disposable diapers have captured about 78% of the U.S. market, but future growth at the expense of cloth diapers will be slower, with the share held by disposables rising to more than 90% by the year 2000.

TABLE 2: **Projected U.S. consumption of fluff pulp by end use (000 metric tons).**

	Total[1]	Infant diapers[2]	Adult incontinence products[3]
1981	807	648	89
1985	985	818	103
1987	901	715	121
1989	883	683	138
1991	913	699	158
1993	936	701	182
1995	952	697	204
1997	964	689	223
1999	977	684	243
2000	982	679	252

1. Includes fluff pulp consumed in feminine pads.
2. Based on the forecast that the market share for superabsorbent diapers will steadily increase through the year 2000.
3. Retail and institutional.

Source: Marketing/Technology Service Inc.

At the same time, the 30-month population of infants in the U.S. is projected to peak around 1990 and then decline to the year 2000. "The net result is that demand for disposable diapers will increase by only 11% from 1987 to 2000, or from about 17.8 billion to 20 billion units," according to Lowe.

SUPERABSORBENT REVOLUTION. At the same time, the growing use of superabsorbents is reducing the amount of fluff pulp required per diaper by about 30%. Superabsorbents have the capacity to absorb up to 50 times their weight in liquid and therefore permit the design of thinner baby diapers and less obtrusive adult incontinence products. Typically, about 5 g of superabsorbent material (usually polyacrylate powder or granules) is used per diaper. This results in a reduction in the weight of fluff pulp used in an average infant diaper from 50 g to 34.7 g—or about 30%, according to Lowe.

Since their introduction less than two years ago, the new diapers containing superabsorbents have captured more than 50% of the U.S. diaper market and may have 93% of the market by 1990, Lowe said. (Availability of the superabsorbent polymer was a problem when the thin diapers were first introduced, but the market is now approaching serious oversupply as producers such as Dow Chemical, Hoechst Celanese, and Chemdal have expanded capacity, according to David F. Phillips, another consultant. Price of the material is currently moving into the $1/lb range, down from over $2 less than six months ago.)

With the increasing use of superabsorbents, U.S. fluff pulp consumption for use in baby diapers dropped from an estimated 811,000 tons in 1986 to 715,000 tons in 1987 and is forecast to decline to 691,000 tons by 1990 and 680,000 tons by the year 2000, Lowe said.

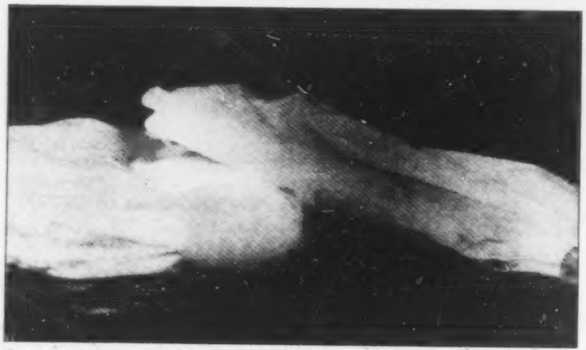
ADULT INCONTINENCE. "The dropoff in fluff pulp demand for infant diapers will be made up largely by improved demand for fluff in adult incontinence products," Lowe noted. Demand for adult incontinence products is expected to show strong growth due to an aging U.S. population and market penetration by disposables. Adult incontinence products currently consume about 121,000 tons of fluff pulp (about equally divided between retail and institutional markets), and demand is projected to double to 252,000 tons by the year 2000.

As a result, overall U.S. domestic demand for fluff pulp will remain nearly constant, rising from about 900,000 tons in 1987 to 982,000 tons by the year 2000. The share of fluff pulp consumed in baby diapers will decline from the current 81% to 69% by the year 2000, while use in adult incontinence products will rise from 6% to 26%. Usage in feminine pads will remain relatively stable at 5% to 6%.

FLUFF INDUSTRY STRUCTURE. Stronger growth in export demand for fluff pulp will help total U.S. pulp production, Lowe said. According to the MTS study, *North American Fluff Pulp Markets and Prospects for 1987-2000*, U.S. fluff pulp production will total about 1.6 million tons in 1987, of which about 900,000 tons will be consumed in the domestic market and about 740,000 tons will be exported.

North America supplies about 70% of total world fluff pulp demand. Total U.S. effective capacity is estimated at nearly 2.0 million tons (mainly consisting of southern pine kraft pulp). Major producers with capacity shares over 20% include Buckeye Cellulose Co., Weyerhaeuser Co., and International Paper Co. Next largest are ITT Rayonier Inc. at around 14% and Kimberly-Clark Corp. at close to 9%, according to MTS.

Total world effective capacity is estimated at 2.8 million metric tons, of which 835,000 tons is outside North America (Table 3). Most of this capacity is in western Europe and includes about 195,000 tons of bleached chemi-thermomechanical/thermomechanical pulp. Major European players include Stora Kopparberg, La Cellulose du Pin, Korsnäs-Marma, and Metsä-Serla.



A current superabsorbent baby diaper (left) is compared to a thermally bonded SAP diaper. The thermally bonded diaper has a 28.2-g core, compared to 45.6-g for the current diaper.

A photomicrograph shows how core stability results from the melting of Pulpex to form "solder joints," or collapsed fibrils, within the cellulose matrix of the diaper core.

SYNTHETIC FIBERS. Another major new development that could lead to the further displacement of fluff pulp is the possible use of synthetic fibers in combination with fluff. The synthetic fiber that is being most widely experimented with is Hercules Pulpex (Type E 338), which is similar in length and morphology to woodpulp.

At least two U.S. fluff pulp producers, Weyerhaeuser Co. (at Plymouth, N.C.) and Temple-Eastex Inc.(at Evadale, Texas) are offering fluff blends containing about 15% to 20% polyethylene fibers. Such blends can be thermally bonded by the absorbent products converter using either through-air bonding (Honeycomb Systems) or infrared heating equipment (Scandimex of Sweden).

When heated to near its melting point, the plastic fibers bind all of the fibers in the pad. As a result, the pad maintains its shape better and does not collapse upon wetting. By maintaining many void spaces, the pad can absorb a greater volume of liquid, according to Peter G. Bither, director of strategy for Hercules Inc. Special finishing on the plastic fibers also improves wicking of liquid into surrounding core material, while the greater structural integrity of the pad permits better utilization of superabsorbent material.

As a result of these advantages, absorbent products can be designed that are thinner, lighter, and stronger. However, the fluff pulp/polymer fiber blends are significantly more expensive (about $900/metric tons vs $560 for 100% southern pine fluff pulp). "Absorbent products manufacturers will have to make their own decisions based on comparing strength and design benefits against the higher cost of the synthetic fiber and the capital cost for thermal bonding," David P. Graves Jr. of Weyerhaeuser told the Insight meeting.

"While Pulpex fluff pulp blend sheets are currently priced 30% to 60% more than normal fluff pulp, core weights in absorbent products can usually be reduced enough to compensate for the higher priced material—especially when superabsorbent material is also included," Bither noted. As an example, he compared an "ultra"-type diaper (45-g core) with a similar Pulpex-bonded diaper (28-g core). Both diapers had similar liquid retention (450 to 500 ml), but the Pulpex-bonded version would be 9% to 15% less expensive to produce, he said. Already a few products using this new technology are starting to be marketed in Europe, the U.S., and Japan.

SPHAGNUM MOSS. The most unusual new development is the joint venture between Johnson & Johnson Inc. of Montreal and St. Raymond Paper Co. to produce a new absorbent material made from purified sphagnum moss at the latter's Desbiens, Que., sulfite pulp mill. The sphagnum material is said to offer twice the absorption capability of fluff pulp and will cost about 15¢/lb vs more than 25¢ for fully bleached fluff woodpulp. Production is scheduled to begin in early 1989.

J&J has been studying the use of moss for about ten years. It purchased about ten square miles of moss-covered land several years ago and has a pilot plant which processes about two or three tons of material a month. A major concern for J&J has been the color of the moss, which naturally ranges from off-white to dark brown. The company has developed a process to bleach it to an acceptable white color, sanitizing it at the same time. The St. Raymond mill had capacity to produce about 120 tpd of unbleached sulfite pulp before it was shut down in 1981. The joint venture will invest about C$20 million to reopen it, with some federal and provincial financial assistance.

While J&J vice president-research Angelo Ruffo notes that "the reaction of most people is incredulity," the new product may not be as strange as it sounds. Among Eskimo tribes, sphagnum has long been used as an absorbent material.

CUSTOMER SHAKEOUT? While fluff pulp manufacturers may be facing a dim future, some of their customers in the disposable products business may not be around at all.

TABLE 3: **Estimated world fluff pulp supply (000 metric tons).**

Pulp grade	**North America**	**Other[1]**
Sulfite[2]	140	280
Sulfate[2]	1,815	380
CTMP/TMP[3]	—	195
Totals:	**1,955**	**855**

1. Mainly western European.
2. Bleached softwood chemical paper-grade pulp.
3. Bleached pulp. CTMP supply in North America is to come online in 1987.

Source: Marketing/Technology Service Inc.

HUGGIES
Luvs
Deluxe
48
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New superabsorbent diapers from producers such as Procter & Gamble, Kimberly-Clark, and Weyerhaeuser are sweeping the U.S. market—and babies seem to like them.

The baby diapers business in the last few years has been marked by intense product development activity and shorter product cycles. About 80% of the U.S. diaper market is held by two companies: Procter & Gamble Co. (P&G, with Pampers and Luvs at about 50%) and Kimberly-Clark (K-C, with Huggies at slightly over 30%). The remainder is split among more than a dozen companies (the largest include J&J's Chicopee Div., Weyerhaeuser, Georgia-Pacific Corp., Whitestone Products, and Pope & Talbot Inc.), which may have increasing difficulty keeping up with the new high rate of product innovation, according to James P. Hanson, director of Marketing/Technology Service.

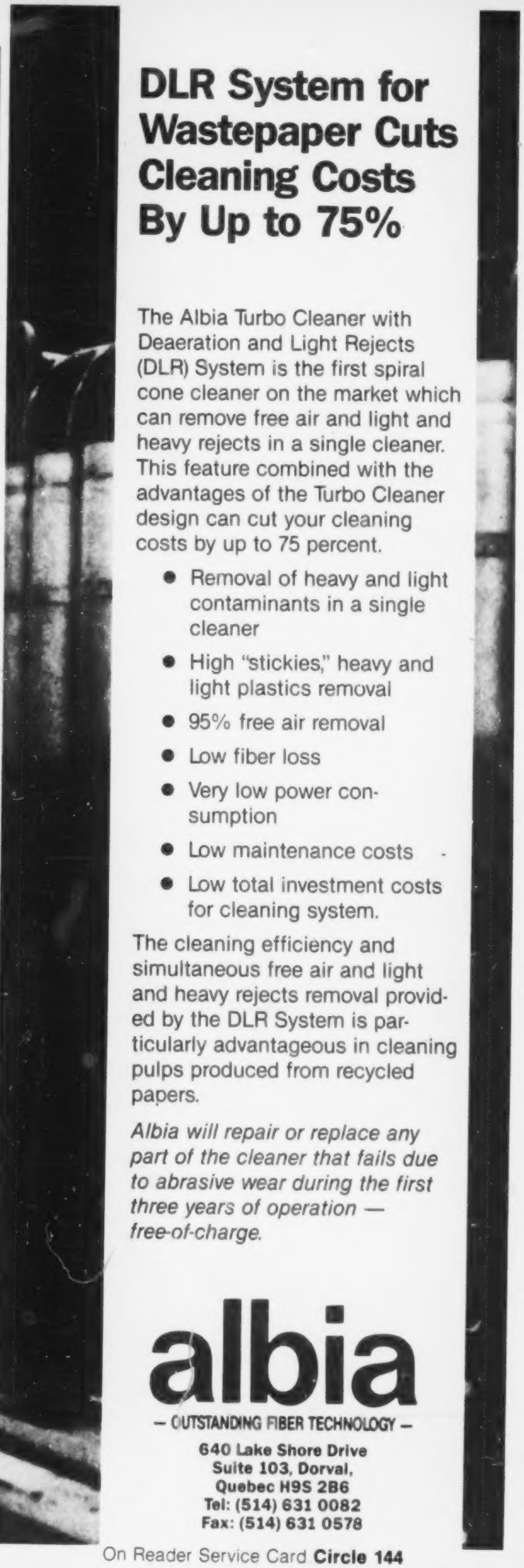
While most private-label producers have been able to adopt "ultra" superabsorbent diaper technology, they may have more difficulty imitating the next round of P&G design. Both P&G and K-C are now contouring the absorbent core of their diapers using complex pocket forming machinery, which will be difficult for smaller independents to duplicate and still avoid patent problems, Hanson noted.

JAPANESE INNOVATIONS. Many of the new innovations in diaper design have been coming from Japan, where the baby diaper market has been skyrocketing. These innovations have included use of superabsorbents, multiple elastic legs, breathable legs, breathable backing film, waistbands, various coverstock innovations, elastic tape tabs, and thermal bonding of absorbent cores, according to Hanson.

Demand for baby diapers in Japan has been growing at a rate of 40% to 70% annually since 1984, and market size has reached about US$660 million (2.5 billion units), according to Hiroshi Mizutani, director of new business development for Kao Corp. Growth was slower in 1987, while a number of new companies (including some paper companies) have entered the market, resulting in intense price competition.

The disposable diaper share of the Japanese market has grown from about 8% in the early 1980s to 34% in 1986 and is projected to reach 64% by 1990, according to Akira Takeuchi of Uni-Charm Corp. The market share held by Kao (Merries) has been fairly stable the last couple of years at about 33%. Uni-Charm's share (Moony, Mamypoko, Ultra-Moony) has declined from about 46% in 1985 to 31% in last May and June, he noted. P&G (Pampers)—which had 89% of the market in 1981—finally appears to be reversing its market share losses, climbing from 9% to 17% over the last two years.

Development in Europe has been slower, although around 1980 Beghin-Say (Lotus) and Vereinigte Paperwerke (Born) were the first producers anywhere to introduce baby diapers containing small amounts of superabsorbent material. Now most producers (including P&G, Colgate-Palmolive Co., and Peadouce) are coming out with "ultra"-type diapers in a burst of product development activity, according to Hanson. ■



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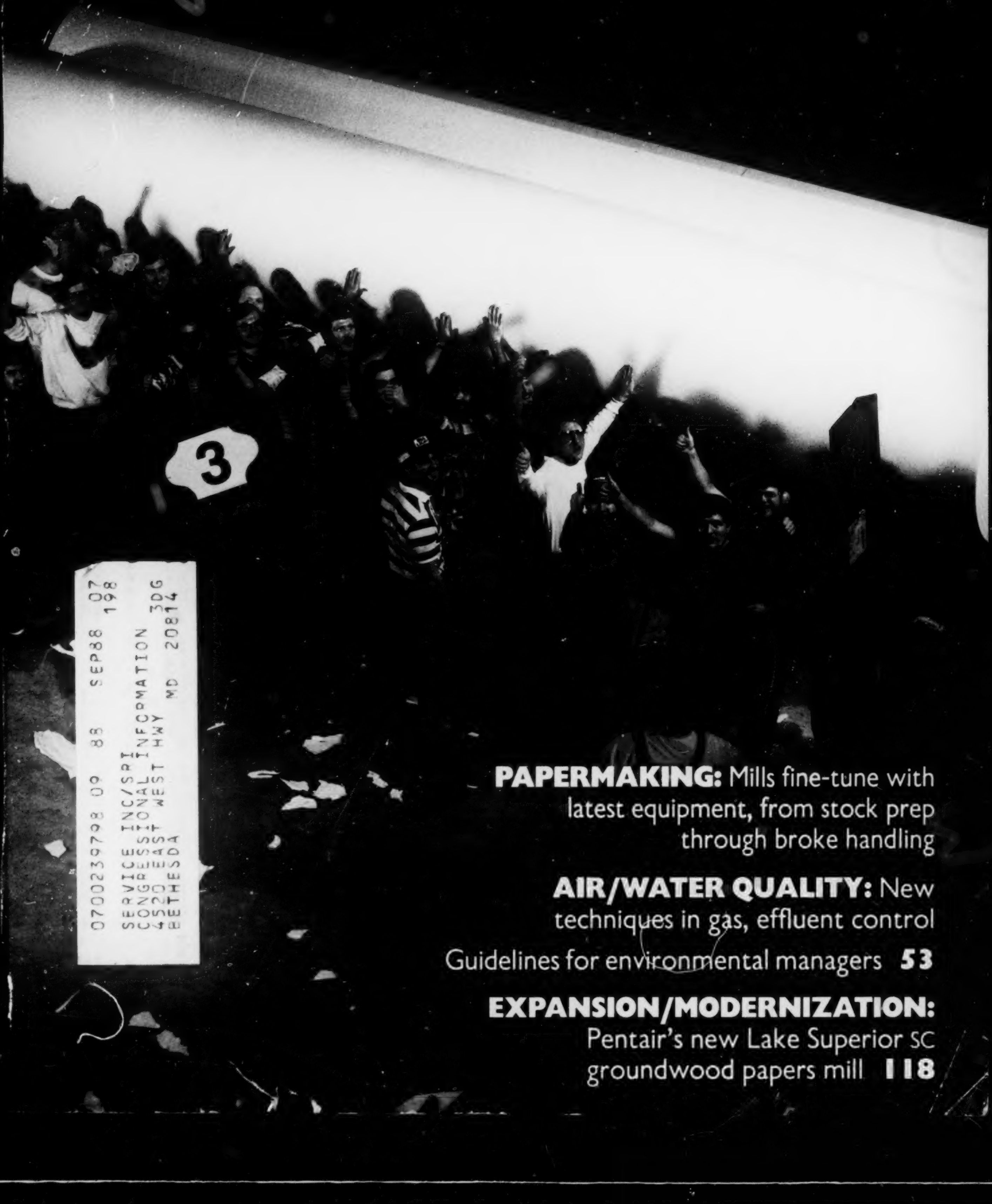

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LSPI puts the first sheet on the reel at 12:44 a.m. on Nov. 4, 1987—21 days ahead of schedule. (Photo courtesy of Lake Superior Paper Industries).

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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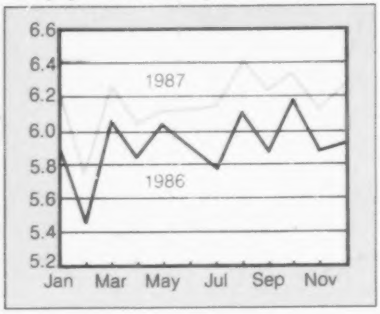

U.S. paper and board production

U.S. production of paper and paperboard totaled 6.4 million tons in January, a record for the month and an increase of 3.2% over a year earlier, according to American Paper Institute figures. Preliminary data for February showed the strong production trend evident in 1987 continuing into the new year. On a seasonally adjusted basis, the January production rate stood just under 75.0 million tpy, up from 74.5 million tpy for 1987. Paperboard continued to out-perform paper, with production up 4.1% on a seasonally adjusted basis vs a 3.0% increase for paper.

Among major grades, printing and writing papers continued to lead the way, as coated paper shipments shot up 11.6% from the previous year and uncoated free-sheet rose 5.8%. Uncoated groundwood was off 9.6% from January 1987, however. Paperboard was led by containerboard, where linerboard production climbed 5.6% and corrugating medium 4.4%. Exports of unbleached kraft linerboard finished 1987 up 7.4% from 1986.

Canadian newsprint shipments dipped 4.4% in January to 716,000 metric tons. Canadian woodpulp shipments totaled 612,000 tons, down 0.2% from a year earlier. Operating rates stood at 99% for newsprint and 97% for woodpulp. ■

		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Jan.	499	1.8	5,983	1.7
Uncoated groundwood (s)	Jan.	122	-9.6	1,462	-9.4
Coated paper (s)	Jan.	634	11.6	7,604	11.6
Uncoated free sheet (s)	Jan.	929	5.8	11,142	6.1
Other printing/writing	Jan.	121	6.1	1,444	5.7
Total packaging and other paper (s)	Jan.	436	-4.8	5,227	-5.3
Tissue	Jan.	436	-0.7	5,228	-0.6
Total paper	**Jan.**	**3,174**	**3.0**	**38,091**	**3.0**
Unbleached kraft paperboard	Jan.	1,638	6.0	19,654	6.0
Semichemical medium	Jan.	488	1.5	5,860	1.3
Bleached paperboard	Jan.	381	-0.3	4,571	-0.3
Recycled paperboard	Jan.	744	1.2	8,922	3.8
Total paperboard	**Jan.**	**3,251**	**3.4**	**39,006**	**4.1**
Total U.S. paper and paperboard output	**Jan.**	**6,425**	**3.2**	**77,098**	**3.2**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Dec.	5,160	4.8	59,582	4.5
Market pulp production	Dec.	723	4.2	8,128	7.2
Wastepaper consumption at paper/board mills	Dec.	1,489	5.8	18,348	6.5
Pulpwood consumption (cords)	Dec.	8,162	4.7	93,946	2.7
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	Jan.	24.782	-0.0	24.782[6]	-0.0
Containerboard inventories at U.S. box plants and mills	Jan. 1	2,486	6.2		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Dec.	1,010	21.2	12,454	7.4
Imports of Canadian newsprint	Dec.	669	15.7	8,588[6]	3.9
U.S. paper exports (including products)	Dec.	460	3.1	5,197	13.2
Exports of unbleached kraft linerboard	Dec.	187	-11.4	2,194	7.4
Exports of woodpulp	Dec.	527	28.9	4,889	9.7
Norscan pulp inventories[4]	Jan. 30	915	-7.8		
Norscan pulp operating rates[4]	Jan.	101%	99%	96%	98%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Jan.	716	-4.4	716[6]	-4.4
Operating rates	Jan.	99%	97%	99%	97%
Inventories held by U.S. consumers	Jan. 30	1,427	7.8		
Other paper/board shipments	Jan.	521	-0.2	521	-0.2
Woodpulp shipments (export only)	Jan.	612	-0.2	612	-0.2
Operating rates	Jan.	97%	98%	97%	98%

1. American Paper Institute 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council 4. North American/Scandinavian paper-grade market pulp 5. Canadian Pulp & Paper Assn. 6. Not annualized (s) = Shipments

Uncoated free-sheet: Prices remain healthy; strong demand should continue through first half of 1988

Grade structure: Uncoated free-sheet papers contain no more than 10% mechanical pulp, with the balance being chemical woodpulp. Excluded are uncoated groundwood, cotton fiber, bristols, and thin papers. Major end uses include office papers (bond, forms bond, reprographic, tablet, and envelope), printing papers (offset, cover and text), and miscellaneous (such as technical, papeterie, or colored school).

Production/capacity: Rising demand for office papers continues to push up production of uncoated free-sheet grades at U.S. mills, which grew 5.5% in 1987 from a year earlier. This is a slower, but still healthy growth following the higher 7.7% increase in 1986.

Likewise, capacity also grew, though more slowly, rising 4.5% in 1987, according to the American Paper Institute. API expects about half that growth in 1988. The single new machine brought online in 1987 was at Domtar Inc.'s Windsor, Que., mill. This 230,000-metric-tpy machine will be joined by a similar unit in early 1989. The U.S. capacity gains came through advancements in the learning curves on machines brought up in 1986, including Hammermill Paper Co.'s Riverdale mill in Selma, Ala., Georgia-Pacific Corp.'s Port Hudson, La., mill, and a converted Stress Kraft machine in Pensacola, Fla. Other mills also gained capacity through upgrades and rebuilds in 1987.

In addition to Domtar's second Windsor machine, 1989 startups include Great Lakes Forest Products, Dryden, Ont. (170,000-metric-tpy), and G-P's second 290,000-short-tpy machine at Port Hudson. In addition, International Paper Co. and its Hammermill unit will increase capacity 200,000 tpy through speedups and rebuilds, and Mohawk Paper will add 15,000 to 20,000 tpy at its Cohoes and Waterford, N.Y., mills.

Outlook: Operating rates at uncoated free-sheet mills are expected to remain between 93% and 95% in 1988, with most analysts predicting two- or three-percentage-point declines in 1989, primarily due to an expected economic recession that could begin sometime in the second half of 1988, or more probably, they say, in the beginning of 1989.

Demand will remain relatively strong through the first half of this year because of inventory building in response to announcements of price increases that took effect in the first quarter. Customers expressed some worry about tonnage availability due to labor problems at various mills, particularly IP's Androscoggin mill in Jay, Maine, and the Hammermill units at Erie and Lock Haven, Pa. Also, there were reportedly startup problems at Domtar's Windsor mill which, added to IP's problems, caused a severe shortage of forms bond in Canada by February. Some forms converters even contacted competitors in an attempt to get stock.

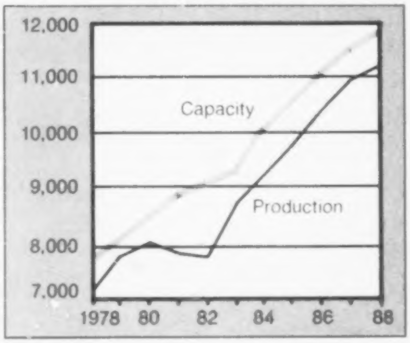
Imports are expected to advance slightly in 1988 from 1987, but not as much as in 1989, when uncoated free-sheet imports could rise over 35%, compared with an estimated 10% in 1988. Prices may rise again before the third quarter, although most analysts expect mills to hold prices at those levels.

Pricing: All grades of uncoated free-sheet paper underwent price increases in 1987 and at the beginning of 1988. These increases brought the significant grades of paper—forms bond and offset—to levels at or near their highs of 1984. The market was experiencing some slight softening, but most buyers and sellers expected the latest increases to hold and paper to sell near list prices.

Price trends for two important grades (year-end, $/short ton) are as follows for book paper, No. 3 offset, 45-lb sheets: 1981, $878; 1982, $680; 1983, $840; 1984, $880; 1985, $800; 1986, $850; 1987, $850; 1988 (1Q), $870 to $890. Forms bond, 15-lb rolls: 1981, $753; 1982, $640; 1983, $745; 1984, $680; 1985, $600; 1986, $620; 1987, $760; 1988 (1Q), $780 to $800.

Markets: Bond, mimeo, duplicating, reprographic—24%; forms—21%; offset printing—25%; envelope—11%; tablet, 4%; carbonless—6%; other—9%. ■

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

	1986	1987	1988e
Production[1]	10,410	10,983	11,049
Capacity[2]	11,023	11,520	11,780
Utilization rate	94.4%	95.3%	93.8%
Imports	454	410e	447
Exports	50	67e	84
Apparent U.S. consumption	10,814	11,326	11,412
lb/capita	89.80	93.19	93.04
GNP ratio	5.82	2.96	2.95

e = Estimate
1 *P&P* estimate
2 American Paper Institute

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. International Paper[1]	2,250	19.1
2. Champion Intl.	1,714	14.6
3. Boise Cascade	910	7.7
4. Georgia-Pacific	900	7.6
5. James River[2]	850	7.2
6. Great Northern[3]	830	7.0
7. Union Camp[2]	750	6.4
8. Weyerhaeuser	620	5.3
9. Mead[4]	475	4.0
10. P.H. Glatfelter[5]	400	3.4

Market share of top five companies:
56.2%

Market share of top ten companies:
82.3%

Total U.S. capacity (1988):
11.780 million tons

1 Includes hammermill and bristols
2 *P&P* estimate
3 Nekoosa Papers
4 Includes carbonless basestock
5 Does not include 75,000 to 95,000 tpy at Ecusta Corp.

SALES & EARNINGS

Canadian industry profits nearly doubled 1986 levels

Tight markets and record production for market pulp and newsprint, the two main exports of the Canadian forest products industry, translated into profits that were close to twice the 1986 level. Earnings in 1987 increased 94.3%, while sales rose 16.8%. Producers were helped by the weakness of the Canadian dollar in relation to most European currencies, although some strengthening against the U.S. dollar was a negative factor. However, most industry executives continue to remain optimistic about prospects for 1988.

MacMillan Bloedel Ltd. enjoyed both record sales and earnings in 1987. Sales for the year exceeded the $3-billion mark for the first time in the company's history. Its operating earnings more than doubled to reach $465.8 million. The company reported that the earnings would have been even better if British Columbia had not instituted its new stumpage system. MacMillan Bloedel reported that it expects its pulp and paper mills to continue to operate at the same capacity levels that were achieved during 1987.

Abitibi-Price Inc.'s earnings increased 17%, while sales were up 8%. Bernd K. Koken, chairman and CEO, attributed this increase to strong newsprint prices as well as to the fact that the company's mills operated at capacity. Koken said that the unfavorable exchange rate from selling newsprint in the U.S. cut into profits, noting that the average value of the U.S. dollar in Canadian terms declined 4.6% from 1986. Koken is optimistic about the company's prospects for 1988, commenting that "newsprint markets will be at their best, and we expect a solid turnaround in the groundwood papers and coated papers segments."

Domtar Inc., which recorded an 11% increase in earnings, reported that while operating profits for pulp, newsprint, and groundwood specialty papers improved signficantly over 1986 levels, earnings from the fine paper segment declined. The company attributed this decline to the reduction in operations at the old Windsor, Que., mill in preparation for the startup of a new uncoated free-sheet paper machine.

Consolidated-Bathurst Inc. said its preliminary earnings before extraordinary items reached a new record of $181.5 million—a 75% improvement over 1986 earnings. Con-Bath attributed the good showing to strong results at its Bridgewater Div. in the U.K. and also to higher shipments and better prices in newsprint, market pulp, and containerboard. President T.O. Stangeland described the company's outlook for 1988 as "quite positive."

British Columbia Forest Products Ltd. enjoyed record sales and earnings in 1987. Last year was the first time BCFP's earnings exceeded $100 million during its 40-year history and is the best result it has had since 1979. The company said that its mills operated at capacity in the fourth quarter and that current market conditions for most forest products are expected to continue throughout the first quarter.

Like BCFP, Canfor Corp.'s net income exceeded $100 million for the first time and represented an increase of $79 million over 1986. Canfor said that profits would have been even better without the export charge on lumber, which cost it about $23 million. Crown Forest Industries Ltd.'s earnings were almost twice as large as its previous best profit in 1979. Sales broke the $1-billion barrier for the first time.

Repap Enterprises Corp.'s earnings were almost four times larger in 1987 than 1986. Nonintegrated Rolland Inc. was one of the few companies to see earnings fall in 1987. The company said that its Fine Papers Div. was adversely affected by rising raw material costs, which could not be matched by corresponding increases in selling prices. ■

Canadian paper industry results.

	Full year 1987 (C$000)			
Paper companies	**Sales**	**% change 1986/87**	**Earnings[1]**	**% change 1986/87**
Abitibi-Price Inc.	$2,988,000	8.1%	$125,700	17.1%
B.C. Forest Products	1,400,000	27.3	140,200	248.8
Canfor Corp.	1,244,900	18.9	102,700	333.3
Cascades Inc.	527,732	19.9	34,148[2]	1.1
Consolidated-Bathurst Inc.	2,261,000	12.0	214,400[2]	334.0
Crown Forest Industries Ltd.	1,000,000	15.7	100,700	287.3
Domtar Inc.	2,568,000	10.4	161,000[2]	11.0
Donohue Inc.	510,100	7.3	44,200	80.4
Great Lakes Forest Products Ltd.	752,221	18.0	96,185	220.1
MacMillan Bloedel Ltd.	3,134,500	24.8	280,600[2]	57.4
Noranda Forest Inc.	4,246,500	19.2	203,200[2]	97.9
Repap Enterprises Corp. Inc.	927,000	45.9	62,500[2]	380.8
Rolland Inc.	387,700	12.5	4,910	−33.3
Scott Paper Ltd.	288,396	10.1	14,514	12.3
Weldwood of Canada Ltd.	741,035	12.5	47,592	58.4
West Fraser Timber	411,700	7.3	47,200	17.4
Total	**$23,388,784**	**16.8%**	**$1,679,749**	**94.3%**

1. Income after taxes, from continuing operations, excluding the most significant nonrecurring items in both years.

2. **Cascades:** 1987 earnings include extraordinary credit of C$12.6 million from sale of Cascades SA shares and tax credits. 1986 includes credit of $10.3 million from stock issue and tax credit. **Consolidated-Bathurst:** 1987 earnings included a $32.9-million credit from sale of investment in Diamond-Bathurst Inc. and of permanently closed plants in Munich, Fed. Rep. Germany, and Burnaby, B.C. This was offest by charge from writedown on sale of investment in Sulbath Exploration Ltd. 1986 earnings included $54.2-million charge from writeoff of oil and gas investments. 1987 quarter included an extraordinary credit of C$4.1 million from the sale of a glass container plant of Domglas. **Domtar:** 1986 earnings include an $8-million credit from use of prior years' tax losses in the U.S. and sale of businesses. **MacMillan Bloedel:** 1986 earnings included an extraordinary gain on sale of an investment of $45 million. **Noranda Forest:** 1986 includes a $22.5-million pretax gain on sale of shares. **Repap Enterprises:** 1987 includes a $5.8-million credit.

ISSUE FOCUS: **PAPERMAKING**

FOCUS ON CAPITAL SPENDING SHIFTS BACK TO EXPANSION OF CAPACITY

High prices and record earnings have encouraged both U.S. and Canadian mills to hurry up their expansion programs

By CARL ESPE, News Editor

Capital spending for papermaking equipment will get a boost over the next several years from a big increase in capacity expansion plans, according to a recent survey by *Pulp & Paper Project Report*, *P&P*'s monthly newsletter on North American expansion and modernization plans.

Thanks to record profits and strong demand, papermakers revised their growth plans sharply upward last year. Over the 1988-90 period, paper and paperboard manufacturers plan to add 6.1 million tpy of new capacity, according to the American Paper Institute. That translates into an average annual growth rate of 2.5%, about 9% higher than average and the highest rate in over 20 years.

Kraft paperboard, free-sheet papers, and newsprint are largely responsible for the pickup in capacity expansion plans. Newsprint, in particular, will rebound sharply in 1990 after eight years in the doldrums. Linerboard will also rebound to historic levels, while a new natural kraft boxboard mill under construction by Mead Corp. will add another 20% to kraft paperboard growth.

To carry out their ambitious expansion plans, companies in both the U.S. and Canada plan record capital spending. On both sides of the border, record earnings and foreign money attracted by weak domestic currencies will help fund strong growth in spending.

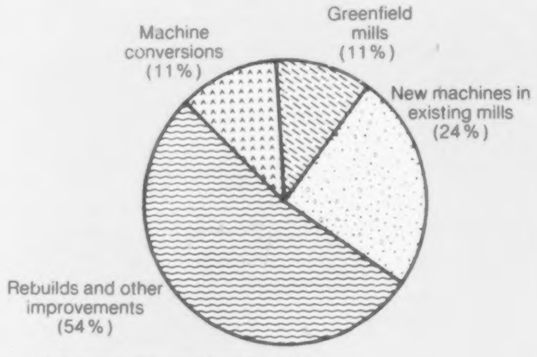
In a *Project Report* survey conducted last November, U.S. pulp and paper companies reported plans to spend $8.04 billion on mill projects in the 1987-92 period, about 19% more than previously planned. In Canada, outlays for the same period are expected to total C$6.67 billion, an increase of 48% over 1986 plans. Longer-range investment plans for the 1990-92 period account for about 24% of these expenditures in both countries.

PAPER MACHINE SPENDING. Reflecting the new emphasis on capacity expansion, spending for new paper machines and improvements to existing machines will account for about $3.5 billion of planned expenditures in the U.S. and C$3.0 billion in Canada. That amounts to about 45% in both cases. The balance between new machines and machine rebuilds is fairly close in the U.S., with 25% earmarked for new paper machine installations and 19% for improvements to existing units. In Canada, however, new machines will capture 33% of planned outlays vs only 13% for machine modifications.

Paper machine upgrades have had a major role in the industry's modernization efforts since the current economic expansion began in 1982, but most of the activity has been in cost cutting, product improvement, and grade realignment. New expansion plans based around rebuild projects have reversed this trend, however, and machine upgrade projects will play an important role in the capacity buildup planned for the next several years.

Rebuilds will contribute the most to new capacity in the paperboard sector, where few new paper machines are currently scheduled. According to API, 14 expansions in the 50,000-plus-tpy range are planned for linerboard machines during the 1987-89 period, and another 20 expansion projects are planned for recycled paperboard. Until recently, only one new linerboard machine installation was planned: Gaylord Container Corp.'s 350,000-tpy machine to be installed at Bogalusa, La., by 1989. Last month, however, Union Camp Corp. an-

FIGURE 1: **Sources of U.S. capacity growth, 1985-1990.**



Source: American Paper Institute.

nounced plans to build a new 460,000-tpy linerboard machine at Savannah, Ga., for startup in 1991.

Net improvements to existing paper machines will account for 78% of U.S. paper and paperboard expansion in 1988, according to API data, up from only 66% in 1987. In contrast, rebuilds and other improvements added only 24% of new capacity in 1986 and 31% in 1985. Net improvements will contribute 63% of new capacity in 1989 before dropping to 40% in 1990, when a number of new paper machines will come online.

PROPOSED PROJECTS. The past several months have seen a steady stream of new project announcements and proposals, with several linked to investments by overseas interests. Daishowa of Japan recently announced a feasibility study for the addition of two new paper machines at its newly acquired uncoated groundwood paper mill in Port Angeles, Wash. Daishowa purchased the mill early this year from James River Corp. for $75 million. If approved, one machine would manufacture newsprint and the other directory papers. Also in the U.S., Pratt Holdings of Australia is studying an investment of about $170 million in its Macon Kraft Inc. kraft linerboard mill in Macon, Ga. Pratt purchased the former Georgia Kraft Co. mill last year. On a somewhat smaller scale, businessman Hwa-Jin Yu of Rep. Korea has signed a letter of intent to build a $41-million recycled paper mill in St. Joseph, Mo.

In Canada, Canfor Corp. and Oji Paper of Japan announced plans to form a new company, Howe Sound Pulp & Paper Co. Ltd., to purchase and expand Canfor's Port Mellon, B.C., mill. Plans call for a new newsprint mill to be built at a cost of C$355 million for startup in 1991. Normick Perron Inc. and Forex Inc., two Quebec-based forest products companies, recently announced a proposal for a new 225,000-metric-tpy newsprint mill to be built in Val d'Or, Que. The deal is contingent on government financial assistance, however.

Kenaf International and CIP Inc. are still pursuing plans for a kenaf-based newsprint mill to be located in south Texas, the two companies reported last month. Plans now call for a 215,000-metric-tpy facility. ■

TABLE 1: **New paper machines in North America.**

Company	Mill	000 tpy	Grade	Startup date
U.S.				
Fort Howard	Rincon, Ga.	250	Tissue	1987
Lake Superior Paper	Duluth, Minn.	230[2]	Uncoated groundwood	1987
Fort Howard	Rincon, Ga.	250	Tissue	1988
Georgia-Pacific	Port Hudson, La.	290	Uncoated free-sheet	1988
James River	Wauna, Ore.	70	Tissue	1988
Midtec Paper	Kimberly, Wis.	210[1]	Coated free-sheet	1988
Potlatch	Cloquet, Minn.	n.a.[1]	Coated free-sheet	1988
Blandin Paper	Grand Rapids, Minn.	200	Coated groundwood	1989
Fort Howard	Rincon, Ga.	n.a.	Tissue	1989
Gaylord Container	Bogalusa, La.	350	Linerboard	1989
International Paper	U.S. South	200[1]	Uncoated free-sheet	1989
Newsprint South	Grenada, Miss.	224[2]	Newsprint	1989
Ponderay Newsprint	Usk, Wash.	175[2]	Newsprint	1989
Champion International	Quinnesec, Mich.	260	Coated free-sheet	1990
Kimberly-Clark	Jenks, Okla.	68[2]	Tissue	1990
Southeast Paper Manufacturing	Dublin, Ga.	230	Newsprint	1990
Willamette Industries	Bennetsville, S.C.	200[2]	Uncoated free-sheet	1990
Mead	Mahrt, Ala.	350	Coated kraft board	1991
Union Camp	Savannah, Ga.	460[1]	Linerboard	1991
Chesapeake	Menasha, Wis.	80	Tissue	n.a.
Fort Howard	Green Bay, Wis.	n.a.	Tissue	n.a.
Kimberly-Clark	Whiting, Wis.	30	Cotton fiber paper	n.a.
Canada				
CIP	Gatineau, Que.	175[1]	Newsprint	1987
Domtar	Windsor, Que.	175	Uncoated free-sheet	1987
Donohue	Clermont, Que.	180[1]	Newsprint	1987
Consolidated-Bathurst	Bathurst, N.B.	150[1]	Semichemical medium	1988
St. Marys Paper	Sault Ste. Marie, Ont.	50	Uncoated groundwood	1988
CIP	Gold River, B.C.	225	Newsprint	1989
Domtar	Windsor, Que.	175	Uncoated free-sheet	1989
Finlay Forest	Mackenzie, B.C.	216	Newsprint	1989
Great Lakes Forest	Dryden, Ont.	175	Uncoated free-sheet	1989
Weyerhaeuser Canada	Prince Albert, Sask.	220	Uncoated free-sheet	1989
Consolidated-Bathurst	Gran[illegible], [illegible]	183[1]	Uncoated groundwood	1990
Great Lakes Forest	Thun[illegible]	240	Newsprint	1991
Howe Sound	Port Mellon, [illegible]	200	Newsprint	1991
Tembec	Temiscaming, [illegible]	110	Bleached board	n.a.

1. Replaces some existing capacity.
2. New greenfield mill.

Source: *P & P Project Report.*

PULP & PAPER

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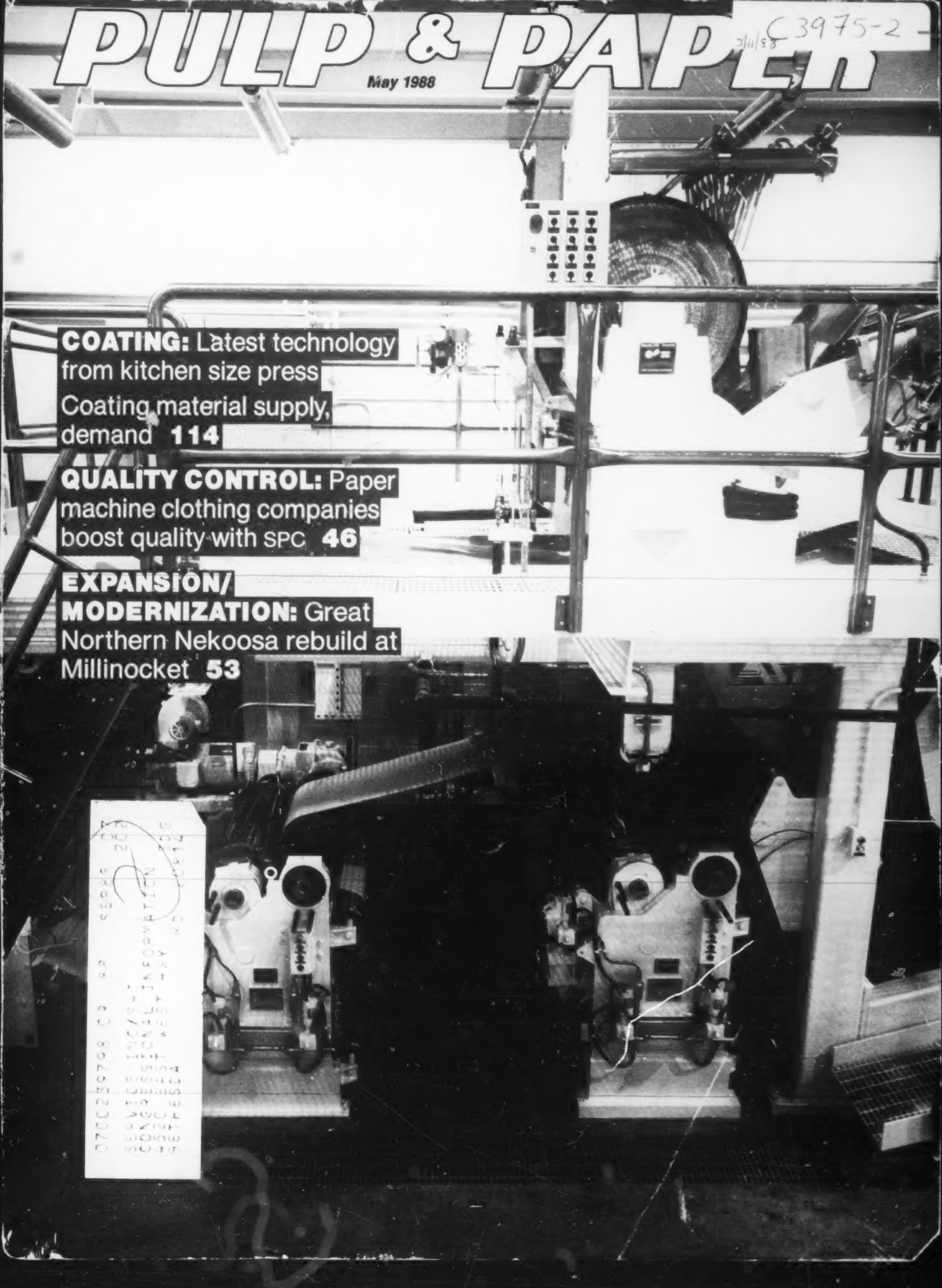

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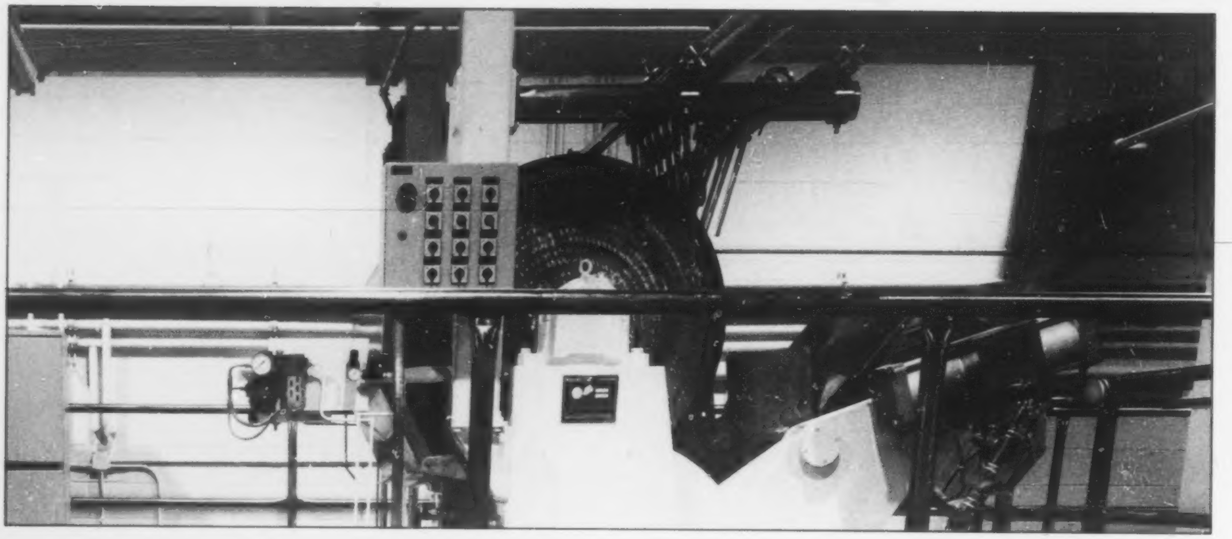

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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Subscriptions & Address Change: Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of $60.00 a year in the U.S. All subscriptions to other countries: $80.00 a year, except Europe and Mediterranean, $90.00 (air service included). Single copy, $6.00, except Buyers Guide, $30.00. Photocopies of articles and complete microform volumes available through University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106.

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Circulation Department, PULP & PAPER,
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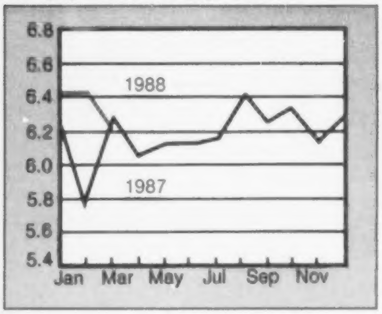
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.2 million tons in February, up 7.5% from a year earlier, according to the American Paper Institute. The month's strong performance was due in part to an extra day, however. On a seasonally adjusted basis, the production trend for February was 75.6 million tpy, up 3.9% from February 1987. The trend rate for paperboard was 38.1 million tpy, up 4.3%, vs 37.5 million tpy for paper, up 3.5%.

Among major grades, coated papers and uncoated free-sheet continued to perform strongly, and unfilled orders were reported to be holding steady at relatively high levels. Newsprint production jumped 5.0%, but U.S. imports of Canadian newsprint dropped off 8.6%. API reports that newsprint inventories at North American mills declined slightly from last year, but that publishers' stocks were up 6.0%. Corrugated box shipments set a new record for the month, and containerboard production for domestic use jumped 7.0% over February 1987.

Canadian newsprint shipments totaled 782,000 metric tons in February, up 3.4% from the same month in 1987. Operating rates climbed to 101%. Woodpulp exports were up 9.0%, to 641,000 tons. Operating rates stood at 97%. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	Feb.	479	8.6	5,865	5.0
Uncoated groundwood (s)	Feb.	111	-12.6	1,382	-12.0
Coated paper (s)	Feb.	592	11.9	7,357	11.8
Uncoated free sheet (s)	Feb.	917	9.8	11,138	8.5
Other printing/writing	Feb.	126	12.5	1,455	5.7
Total packaging and other paper (s)	Feb.	434	4.6	5,243	-0.5
Tissue	Feb.	437	5.6	5,298	3.4
Total paper	**Feb.**	**3,094**	**7.7**	**37,738**	**5.5**
Unbleached kraft paperboard	Feb.	1,576	10.7	19,276	8.2
Semichemical medium	Feb.	454	3.4	5,655	2.3
Bleached paperboard	Feb.	359	4.7	4,408	1.3
Recycled paperboard	Feb.	719	4.4	8,812	6.1
Total paperboard	**Feb.**	**3,100**	**7.1**	**38,151**	**6.1**
Total U.S. paper and paperboard output	**Feb.**	**6,202**	**7.5**	**75,889**	**5.8**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Jan.	5,271	3.8	63,252	4.2
Market pulp production	Jan.	722	8.1	8,668	9.6
Wastepaper consumption at paper/board mills	Jan.	1,567	9.4	18,808	5.6
Pulpwood consumption (cords)	Jan.	8,223	2.2	98,676	2.2
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft^2)	Feb.	24.679	8.2	49.458[6]	4.1
Containerboard inventories at U.S. box plants and mills	Feb. 1	2,659	13.6		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Jan.	1,033	-3.5	12,403	-3.5
Imports of Canadian newsprint	Jan.	709	-8.6	8,504[6]	-8.7
U.S. paper exports (including products)	Jan.	492	20.0	5,907	20.1
Exports of unbleached kraft linerboard	Jan.	150	-12.8	1,800	-12.8
Exports of woodpulp	Jan.	391	27.8	4,687	27.5
Norscan pulp inventories[4]	Feb. 29	905	4.0		
Norscan pulp operating rates[4]	Feb.	101%	101%	99%	102%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	Feb.	782	3.4	1,498[6]	-0.5
Operating rates	Feb.	101%	99%	99%	98%
Inventories held by U.S. consumers	Feb. 29	1,482	9.0		
Other paper/board shipments	Feb.	530	5.0	1,053	2.5
Woodpulp shipments (export only)	Feb.	641	9.0	1,254	4.4
Operating rates	Feb.	97%	98%	98%	98%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Coated groundwood: Prices climb to near-record levels as buyers seek lightweight coated papers

Grade structure: Coated groundwood paper grades contain at least 10% mechanical pulp, with chemical pulp and fillers making up the balance. Slightly less than 85% of coated groundwood production is No. 5. The rest is the No. 4 grade, which has higher brightness and usually heavier basis weights. No. 5, therefore, is valued for its lighter basis weights and its runability.

Much of the coated groundwood paper is made in the 32-lb to 50-lb basis weight range (25 × 38 in. in reams of 500 sheets), although some 30-lb paper is made and weights can run to 70 lb. Coated groundwood competes against uncoated groundwood papers in many end uses, including magazines, Sunday newspaper supplements, catalogs, newspaper advertising inserts, directories, and direct mail flyers. The coat weight on lightweight coated (LWC) paper may be about 30% of total sheet weight.

Production/capacity: Shipments of coated groundwood papers increased a healthy 9% in 1987 compared with 1986, continuing a strong growth trend that included 1984 and 1985. As in the past, the strongest growth in demand occurred in the commercial printing sector, where shipments of coated No. 5 rose over 20% from 1986 to 1987. This tonnage was used for such items as inserts and flyers. Total shipments of No. 5 rose about 7% in 1987. No. 4 posted an 18% gain.

Machines first brought online in late 1986 began to make their presence felt in 1987, but problems with one paper machine—International Paper Co.'s 200,000-tpy machine in Pine Bluff, Ark.—and stronger demand kept the new capacity from weakening the market as the *anticipation* of that capacity had done in 1986. Other machines supplying new tonnage were Bowater Inc., Catawba, S.C. (197,000 tpy); Consolidated Papers Inc., Wisconsin Rapids, Wis. (180,000 tpy, although the company later converted another coated groundwood machine to coated free-sheet [60,000 tpy]); and Repap Enterprises Inc., New Castle, N.B. (200,000 metric tpy). American Paper Institute said that coated groundwood capacity rose about 8.8% to more than 4.1 million tons in 1987. Capacity is expected to advance just under 2% in 1988 as these machines move to the top of their learning curves.

Outlook: Strong growth from commercial printers and some inventory building will continue to keep markets tight for most of 1988. As fears calm about a recession late in the year or in 1989, an attendant slide in demand is not seen as certain. Magazines also may end 1988 in better shape than in 1987 if they are fully able to take advantage of the Olympics and the U.S. presidential election.

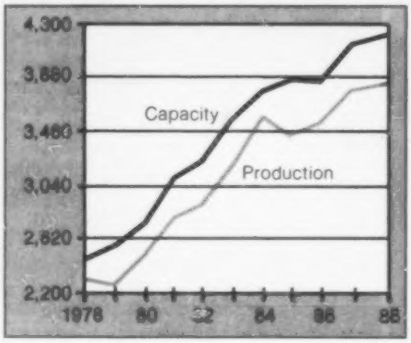
The only new capacity due onstream in the near future is 200,000 tons of coated groundwood at Blandin Paper Co.'s Grand Rapids, Minn., mill. Another 200,000 metric tons may be announced at Repap Inc.'s Miramichi, N.B., mill, and Weyerhaeuser Co. may be considering a second LWC machine at Columbus, Miss. Although 600,000 to 800,000 tons of new coated groundwood papers will be available in the next few years from Europe and Scandinavia, little of that is expected to end up in the U.S. Possibly more of a threat is new and higher-quality supercalendered (SC) paper capacity, such as the web-sized offset paper (WSOP) from Abitibi-Price Inc.'s Kenogami, Que., mill and SC-A paper from Lake Superior Paper Industries' new mill in Duluth, Minn.

Prices: Coated groundwood prices firmed up throughout 1987 as related grades, especially uncoated groundwoods, also became tight. This came as a welcome change from late 1986, when fears of overcapacity caused prices to plunge. List prices were raised Jan. 1, and as 1988 entered the second quarter most market participants and observers expected an announcement of additional price increases in April or May, which would bring lists to record highs.

The Jan. 1, 1988, increase brought No. 5 40-lb offset in rolls to $840/ton. Another hike in the second quarter probably would add 3% to that.

Historical pricing trends ($/short ton; year-end; except 1988, which is first quarter) for 34-lb rotonews paper are: 1981, $760; 1982, $760; 1983, $782; 1984, $890; 1985, $931; 1986, $860; 1987, $890; 1988, $940. ■

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1986	1987	1988e
Production	3,478	3,785	3,958[1]
Capacity[2]	3,799	4,132	4,211
Utilization rate	91.6	91.6	94.0
Imports	401	500	510
Exports	36	49	59
Apparent U.S. consumption	3,843	4,236	4,409
lb/capita	31.91	34.85	35.95
GNP ratio	2.07	2.22	2.28

e = Estimate.

[1] *P&P estimate.*

[2] American Paper Institute.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Champion	689	16.4
2. International Paper[1]	630	15.0
3. Consolidated[1]	550	13.1
4. Bowater	325	7.7
5. Boise[1]	320	7.6
6. James River[1]	295	7.0
7. Blandin	285	6.8
8. Mead	270	6.4
9. Pentair[2]	220	5.2
10. Midtec[3]	193	4.6

Market share of top five companies:
59.7%

Market share of top ten companies:
89.7%

Total U.S. capacity (1987):
4.211 million short tons

[1] *P&P* estimate.

[2] Niagara of Wis.

[3] Kimberly, Wis.

NEWSPRINT

Abitibi, P&W to construct newsprint mill

Parsons & Whittemore Inc. and Abitibi-Price Inc. announced a tentative agreement to jointly build a 220,000-metric-tpy newsprint mill to be located near P&W's Alabama River Pulp Co. bleached kraft market pulp mill in Claiborne, Ala., provided financing is arranged, freight rates are negotiated, and regulatory approval is given.

Under the present plan, Abitibi would run the mill and market the output, while P&W would be responsible for mill design and construction, according to an Abitibi spokeswoman. P&W is owned by the Landegger family, which also owns the St. Anne-Nackawic Pulp & Paper Co. Ltd. market pulp mill in Nackawic, N.B., as well as paper-machinery manufacturer Black Clawson Industries Inc.

The Alabama River mill would be operated separately, although some operations, such as office staff and effluent treatment, might be combined to some extent. The newsprint machine would be supplied with fiber from the mill's own thermomechanical pulp mill, although probably close to 10% of the furnish would consist of kraft pulp from Alabama River. Additional kraft pulp requirements should be taken care of by a $35-million, three-year optimization program under way at Alabama River that would add at least 30,000 tpy of capacity, according to a mill executive. If plans proceed on schedule, the two companies expect the $320-million greenfield mill project to be completed by the end of 1990. The Abitibi spokeswoman said that the 50/50 joint-venture mill's output would be marketed mainly in the eastern U.S., where the company already has "an excellent customer base" supplied mainly by its Canadian mills.

Abitibi, already the world's largest newsprint producer, additionally has a joint-venture newsprint mill (Augusta Newsprint Co.) in Augusta, Ga., in equal partnership with Thompson Newspapers Ltd. Another newsprint mill in Claiborne would raise Abitibi's total newsprint capacity to about 2.12 million metric tpy. ■

Major North American new newsprint expansions.

U.S.	Net increase (metric tons)	Startup
Newsprint South	205,000	late 1989
Ponderay Newsprint	180,000	early 1990
Southeast Paper Mfg. Co.	190,000	1990
Abitibi-Price Inc./Parsons & Whittemore Inc.	220,000	late 1990
Total	**795,000**	
Canada		
Finlay Forest Industries Inc.	210,000	spring 1989
CIP Inc.	225,000	fall 1989
Alberta Newsprint	220,000	spring 1990
Atlantic Packaging Corp.	150,000	mid-1990
Great Lakes Forest Products Ltd. (net)	+60,000	early 1991
Canfor Corp./Oji	190,000	1991
Total	**1,055,000**	

Source: *PaperTree Letter*

Atlantic Packaging to build newsprint/tissue mill

Atlantic Packaging Products Ltd. has started groundwork for a 150,000-metric-tpy recycled newsprint machine and a 35,000-tpy tissue machine on a greenfield site in Whitby, Ont. It expects to be producing tissue there by January 1989 and newsprint by late 1989 or early 1990. The company's expansion into newsprint will be its first, although it already uses secondary fiber at its 120,000-metric-tpy recycled containerboard mill and at its 20,000-tpy tissue mill in Scarborough, Ont.

A company spokesman said Atlantic felt the newsprint mill would be a good investment, particularly with the fiber base being 100% recycled. A close observer noted that the company has been very successful with its recycling efforts. The new mill will require about 65,000 tpy of computer printout and ledger stock for its tissue machine and about 165,000 tpy of old newspapers for its newsprint machine. Both machines are being supplied by Voith. The 300,000-ft^2 newsprint mill is expected to have a permanent staff of approximately 200 employees.

The company expects that most of the tissue output will be sold in Canada, while most of the newsprint will be exported to the U.S. and overseas. A close observer noted that long-term contracts with newspaper publishers were being negotiated. Details on the financing were not released, other than that Atlantic will own the mill outright and government aid was not expected. ■

Donohue to build C$30-million deinking plant

Donohue Inc. said that its directors had given it tentative approval to construct a deinking facility at its Clermont, Que., mill at an estimated cost of C$30 million. Final approval, however, is subject to grants from the provincial and federal governments.

The plant would use recycled paper from such products as newspapers and magazines for its furnish, reducing the amount of virgin fiber used in making newsprint at the mill, it was noted. Donohue said this would make it the first company in Quebec to recycle wastepaper in a fully integrated mill. The deinking facility will initially produce 50,000 metric tpy.

Gerald Drouin, v.p. of administration for Donohue, said the additional pulping capacity would somewhat offset the mill's purchased chemical pulp requirements as well as provide for additional newsprint expansion in the long term. This is the first time the mill will use recycled fiber in its furnish. ■

TISSUE

Irving Tissue to install 60,000-tpy machine

Irving Tissue Co. said it will install a new machine at the tissue mill in St. John, N.B., that it recently acquired from Kimberly-Clark Corp. The company said the new unit will increase the mill's tissue capacity by fourfold, bringing total capacity to about 75,000 short tpy when it starts up in mid-1989. The mill currently operates a 15,000-tpy machine, from which all the output is sold to K-C in the form of parent rolls. A spokesman for Irving Tissue said the supplier for the machine has been chosen but declined to name the company.

Irving Tissue is a subsidiary of Irving Pulp & Paper Ltd., which operates an 825-tpd bleached and semibleached kraft market pulp mill next to the tissue mill. A spokesman for the company said it is not yet known by how much market pulp capacity at Irving Pulp will be reduced due to the addition of the new machine because the furnish mix for the new unit is still being decided.

No converting equipment will be installed at the mill. Instead, all of the output from the new high-speed unit will be sold on the market as parent rolls. K-C will continue to contract to buy the output from the mill's existing machine. Irving Tissue employs about 85 people. The expansion is expected to increase employment at the mill by an unspecified amount.

- Canadian producers of consumer tissue are trying to implement price increases ranging from 5% to 10% on consumer tissue products. Sources indicate the 5% price hike attempted last spring did not go through. An increase averaging 7% on commercial tissue was announced early this year as well. This follows a 7% increase in first-quarter 1987 that was largely successful. ■

Fort Howard starts another machine at Savannah River

Fort Howard Corp. started up its second recycled tissue machine at its Savannah River mill in Rincon, Ga., on Mar. 28, exactly one year after the first machine started up. Both machines are Beloit twin-wires with capacity for about 250 tpd of tissue. The mill is converting all of the tissue it produces into bathroom tissue, towels, and napkins to be sold primarily in the commercial and industrial market, although the company declined to say how many converting lines are now operating.

In addition to the second paper machine, the mill installed a Foster Wheeler fluidized bed coal-burning boiler that has been running for a few months. It also has two gas-fired turbine generators that have been online for about 18 months. The mill currently employs about 400 nonunion workers. About 100 more employees will be hired during the summer.

Fort Howard is moving ahead with plans to install a third Beloit tissue machine in what eventually will be a four-machine, 1,500-tpd tissue mill. Fluor Corp. has been awarded a contract worth over $170 million to provide engineering, procurement, and construction services for the new machine, which is slated to start up in December 1989. (Fluor Daniel provided similar services for the first two machines.) Phase three of the mill construction will include installation of a second Foster Wheeler fluidized bed coal-burning boiler as well as additional converting lines. In early 1987 Fort Howard said it would try to sell some of the mill's excess power to a local utility, but such a contract has not yet been concluded.

Meanwhile, the company has announced it has received the necessary permits from Wisconsin's Dept. of Natural Resources to enable it to proceed with the construction of a second dry-former tissue machine at its Green Bay, Wis., mill. Construction of the unit will begin in May and should be completed early next year. The expansion will cost about $20 million. ■

ENVIRONMENT

Widespread testing for dioxin coming soon

The Dioxin Task Group, which was formed by the American Paper Institute and the National Council for Air & Stream Improvement (NCASI), and the Environmental Protection Agency are on the verge of signing an agreement to create a cooperative dioxin testing program. Tests for trace levels of dioxin in bleached pulp, treated effluent, and sludge are expected to begin this spring at 103 mills in the U.S. The mills will pay for these tests. In addition, NCASI will conduct a more in-depth study at about 25 mills to determine what mill processes are responsible for generating the dioxin.

Both of these studies will hopefully reveal why so much variability existed in the results of the five-mill study conducted last year. The dioxin program is expected to use about half of NCASI's budget for 1988.

Product testing. In February 1987, the API and NCASI formed the Dioxin Task Group, which is headed by six top-level industry executives and consists of about 40 other industry managers and scientists. At a speech given at API's annual Paper Week earlier this month, Thomas Norris, president and CEO of P.H. Glatfelter Co. and a task group leader, described the efforts to determine if dioxin is present in paper products with which the average consumer most frequently comes in contact, such as communication papers, disposable diapers, and paper towels.

The task group purchased five samples of each product at grocery stores and ground them up to form one composite sample for testing from each category. A four-step testing plan was developed. First, the group tested each sample for the presence and concentration of dioxin (see table). It then measured how much dioxin was transferred from the product to the user. Next, each sample was assigned a potency for dioxin according to Food & Drug Administration standards. Finally, the health risk of a 70-year lifetime exposure to the product was calculated. Norris

Product test results.

Product	Dioxin/ppt
Disposable diapers	n.d.
Paper towels	3.8
Paper plates	6.4
Barrier food packaging	7.8
Bond paper	13.0
Nonbarrier food packaging	14.0

n.d. — not detectable.
Source: Dioxin Task Group, API/NCASI.

said that all product testing was done by a qualified laboratory and that lifetime use pattern assessments were developed by an outside consultant.

Norris expects all product testing to be completed later this year, at which time results will be made available to the public. Testing on bleached coffee filters is progressing. Coffee is being made in 75-g batches and sent off to laboratories, which have had some trouble developing the right kind of testing apparatus. Work on fatty food packaging is still being done as well.

However, Norris reiterated that paper products made from bleached pulp are safe and that consumers can use them with confidence. Norris also said the risk assessment work establishes that the actual detection numbers shown in the table are "thousands, and, in some cases, practically millions of times lower than the levels at which even our government would have any concern." ■

Champion's Canton mill slates major upgrade

Champion International Corp.'s mill in Canton, N.C., has reached a tentative agreement with the Environmental Protection Agency and the states of North Carolina and Tennessee over the mill's wastewater discharge permit. While the agreement has yet to be finalized, Champion will not have to close the 79-year-old printing paper and bleached board mill, as it said it would do if the EPA finalized certain parts of the draft permit. Instead, Champion estimates that it will have to spend about $150 to $200 million over three years to modernize the mill and bring it into compliance.

A 50% reduction in the color discharged from the mill is called for in the proposed five-year permit. Color discharge will have to be reduced further during periods of drought and low river flow. Champion is currently applying for variances from the water-quality discharge permits of both North Carolina and Tennessee. If this procedure goes smoothly, the EPA is expected to issue a new five-year permit in September.

Champion is still mapping out what kinds of capital expenditures will be required to bring Canton into compliance with the permit, although a spokesman for the company said most of the money will go toward an extensive modernization of the pulp mill. He indicated that it is very probable that the mill will install an oxygen deliquification system.

The Canton mill is Champion's only facility that produces liquid packaging board. The mill has capacity for 248,420 tpy of bleached board on one machine (most of which is turned into milk cartons, with a small amount supplying Champion's ovenable board mill in Belvidere, Ill.) and 333,982 tpy of printing paper on five machines.

The dispute over the mill's discharge permit was initiated by Tennessee because it did not feel its water quality standards for color were being met when the receiving stream (the Pigeon River) crossed the border from North Carolina. Early last year, in a case involving International Paper Co.'s Ticonderoga, N.Y., mill, the Supreme Court ruled that a state cannot charge a mill in a neighboring state with violating its antipollution laws. Observers feel this precedent encouraged Tennessee to compromise in the Canton mill situation. ■

API files suit against EPA over Region 5

The American Paper Institute has filed suit against the Environmental Protection Agency in the Seventh Circuit Court of Appeals in Chicago, Ill., because of the trouble paper mills in EPA's Region 5 have encountered in trying to get their National Pollution Discharge Elimination System (NPDES) permits renewed. Four companies have also joined the suit: Fort Howard Corp., Stone Container Corp., Nekoosa Packaging Inc., and James River Corp.

The suit takes issue with the EPA on two counts. First, it challenges the EPA's objection to the Clean Water Act permits that Wisconsin's Dept. of Natural Resources would have issued to 11 mills in Wisconsin. On Nov. 4, EPA's Region 5 vetoed the DNR's decision to issue discharge permits to 11 paper mills that have been operating without new permits since August 1986. Mills owned by two of the plaintiffs—James River and Nekoosa Packaging—are among these 11.

Second, the suit challenges the EPA's antidegradation policy. This refers in part to the fact that Region 5 has said it will not expand the limits in discharge permits despite the fact that most of the 35 mills in Wisconsin, not to mention the mills elsewhere in Region 5, have increased their capacity since effluent limits were established in 1977-78. An API spokesman said that the association and its member companies are concerned about the national implications of Region 5's position.

This is the second suit filed against the EPA on this subject. Earlier this year some environmental groups filed suit against the EPA for not withdrawing the Wisconsin DNR's permitting authority. ■

LABOR

British Columbia labor talks started Apr. 18

Negotiations between almost all the pulp and paper mills in British Columbia and the two unions that operate those mills—the Canadian Paperworkers Union and the Pulp & Paper Workers of Canada—began Apr. 18.

Contracts at 19 mills in British Columbia will expire June 30 as will contracts at most sawmills in the province. The International Woodworkers Assn. has announced it will seek a one-year contract with a C$2/hour wage increase, among other things. Talks between the IWA and the sawmills began Apr. 25, at which time the Forest Industrial Relations Bureau was expected to respond to the IWA's $2/hour demand.

Bargaining is expected to be difficult because of the industry's current prosperity and the low settlement reached two years ago. The unions are coming off of an agreement which provided for no wage increase in the first year and only C40¢/hour (2.5%) in the second year.

Richard Kelertas, an analyst with McLeod Young Weir in Toronto, Ont., says that "the real sticking point between the unions and the industry will be the issue of contracting out." The industry wants to retain the flexibility to assign subcontracting of some mill maintenance and woodlands activities to nonunion personnel, he notes. The unions, however, have said that they will not budge on the issue and do not want to give up any more job security.

The contracting out and flexible shift scheduling were the primary issues behind the four-month strike by the IWA in 1986 (which also affected some pulp mills). The strike ended when a royal commission was established to study the issue.

This body issued a report in February 1988. The commission advised the companies that they should not contract out work capable of being performed reasonably by the IWA on a cost-effective basis. The commission also recommended that the IWA be more flexible in its work rules and that companies should have the right to unilaterally schedule shifts subject to certain conditions.

While the report provides some guidelines for negotiating new contracts, it is nonbinding, and sawmill workers have indicated they are not satisfied with the current state of affairs. In October 1987, the IWA membership voted to increase its dues by C$5/month to build a strike fund that will accrue C$200,000 every month.

Kelertas believes that the "likelihood of a moderately long (4- to 6-week) strike is very strong." Such a disruption would cause havoc in the already tight pulp and newsprint markets. British Columbia accounts for 51% of Canada's market pulp capacity and for 16% of its newsprint production. ■

IP, UPIU execs agree; locals evaluating proposals

The first breakthrough in negotiations between International Paper Co. and the United Paperworkers International Union occurred last month. IP's vice president of human resources, David W. Oskin, announced that "discussions between company executives and top officials of the UPIU have resulted in the presentation of contract proposals for the four facilities currently experiencing labor disputes." A spokesman for the UPIU said the locals involved will now begin evaluating the proposals. Both sides have agreed not to release details of the contracts.

UPIU president Wayne Glenn, the union leaders of the striking locals, and members of IP management have been meeting since Mar. 28 in an effort to solve the labor dispute, which involves about 3,400 union members. The dispute started in March 1987, when about 1,200 UPIU members were locked out of IP's Mobile, Ala., mill after contract negotiations broke down. UPIU members are on strike at IP's Jay, Maine, mill; Hammermill's Lock Haven, Pa., mill; and Nicolet Paper in De Pere, Wis.

The strikes began over the issue of premium pay for Sunday and holiday work. Since IP is running all of the struck mills with what it says are permanent replacements, the UPIU is now saying that its first priority is to get the jobs back.

The proposals may smooth the way for Glenn to sign contracts that have been ratified by several UPIU locals. UPIU locals approved company offers at IP's mills in Corinth, N.Y.; Pine Bluff, Ark.; Moss Point, Miss.; and Natchez, Miss., but the international has not signed the agreements. Union workers at IP's mill in Camden, Ark., are working without a contract. Members of the Assn. of Western Pulp & Paper Workers are working under an implemented contract at IP's Gardiner, Ore., mill. The UPIU's contract at IP's mill in Ticonderoga, N.Y., expires June 1, while the one at IP's mill in Vicksburg, Miss., expires Sept. 26. ■

Safety awards

The American Paper Institute recognized five paper companies for outstanding safety performances at the annual Paper Week meeting held in March. The awards were given to mills or converting operations with the lowest accident and injury records, based on OSHA statistics over the past five years.

Procter & Gamble Co. operations won three awards (Albany, Ga.; Mehoopany, Pa.; and Cape Girardeau, Mo.). And Union Camp Corp. also won three awards: one for its Montgomery, Ala., mill and one each for the Converting Dept. and the Retail Packaging Div. at Savannah, Ga. James River Corp.'s converting operations in Newnan, Ga., and the H.P. Smith Div. in Iowa City, Iowa, each won an award. Also recognized were Nekoosa Packaging's Eastern Woodlands Div. and Mead Corp.'s Stevenson, Ala., mill. ■

PACKAGING GRADES

Opposition to plastic packaging on the rise

The way Suffolk County, N.Y., gets rid of its garbage will have significant consequences for producers of plastic grocery bags, foam plastic food containers, and other disposable plastic packaging. On Mar. 29, the Suffolk County legislature approved a bill that would require retail food establishments, including fast-food restaurants and supermarkets, to use biodegradable packaging in the course of doing business. The measure would not affect prepackaged goods shipped into Suffolk County, but it still represents the most comprehensive prohibition against plastic packaging in the country.

More state and local governments are moving ahead this year to restrict, tax, or ban nondegradable and nonrecyclable plastic packaging products and to simultaneously promote recycling. These initiatives reflect growing public concern about reducing solid waste as the country's landfills reach their capacity. Because packaging accounts for a third of all garbage and represents an excessive "throwaway" lifestyle to many Americans, it has become the target of community efforts to reduce the economic and environmental costs of waste management. And because plastics are the fastest growing segment of the packaging industry, are difficult to recycle, and displace at least three times as much landfill space for their weight as other materials, they have become the "bull's-eye of the target," according to one plastics marketing executive.

Dozens of proposals similar to Suffolk County's are pending throughout the country, and this has mobilized environmentalists as well as industry groups. One of the groups testifying at the Suffolk County public hearings was the newly formed Pro-Environment Packaging Council, composed of companies in the paper and paperboard industry. The council's charter members include Champion International Corp., Georgia-Pacific Corp., Gaylord Container Corp., International Paper Co., The Newark Group, Port Townsend Paper Corp., Stone Container Corp., and Union Camp Corp.

"The mission of the council is to call attention to the benefits and uses of paper and paperboard packaging and to work to ensure that legislation that is pending or will be enacted is in the best interest of our industry," said Samuel Posner, who is president of the council and vice president of retail packaging for Stone Container. He added that although the country's immense solid-waste problems have made the virtues of paper and paperboard packaging more relevant than ever, the council does not intend to "bash" plastics.

Opponents of the Suffolk County bill, including Mobil Corp., Amoco Corp., and local packaging distributors, argue that the measure would not significantly reduce the volume of garbage in the county because disposable plastic packaging accounts for only a small percentage of the waste generated locally. The bill ignores the large volume of plastics used in PET-resin soda bottles, disposable diapers, and other products. Opponents also argue that substituting paper for plastics would lead to higher disposal costs because the paper products weigh six to ten times more than the replaced plastic items.

Despite these considerations, the Suffolk bill is popular with the public and was approved by a vote of 16 to 0, with two abstentions. This worries the plastics industry because "Suffolk has been out front on a number of issues that blossomed nationwide, including bottle-return bills and no-smoking laws," said Kenneth Lane of the Society of the Plastics Industry.

Some plastic packaging producers have responded to the problem by developing degradable products that deteriorate in a few years from bacterial agents or ultraviolet light. Photodegradable, six-pack plastic rings have been successfully marketed in 11 states that require that the rings be degradable. Vons Grocery Co. has recently started using photodegradable plastic grocery sacks in all of its San Diego, Calif., supermarkets, and Amko Plastics Inc. has started selling biodegradable plastic merchandise bags. Amko's degradable plastic film is made from conventional polyethylene resin with a corn starch additive that initiates biodegradation after the bag is disposed of in a landfill. ■

Composition of municipal waste.

	% of waste	Material recovery rate
Paper	37.1%	26.6%
Glass	8.7%	10.0%
Aluminum	0.6%	48.7%
Plastics	7.2%	1.0%
Food waste	8.1%	0.0%
Yard waste	17.9%	0.5%
Other	10.4%	3.0%

Source: Franklin Associates and industry.

Du Pont expected to buy small Champion mill in Ohio

Du Pont Co. and Champion International Inc. have essentially agreed to the sale of Champion's electronic communications paper mill in Columbus, Ohio. Also included in the deal is a coating and finishing plant located in McKinney, Texas. No value for the purchase has been revealed, and a final sales agreement is being negotiated.

The 17,000-tpy paper mill would be taken over by Du Pont's Industrial Imaging Systems Div., according to John Roberts, a company spokesman. This division makes electronic design stations for packaging, advertising, and graphic design, Roberts said. ■

Portals' 2,500-tpy security and currency mill for sale

Portals Inc., a paper mill in Hawkinsville, Ga., with capacity for 2,500 tpy of security and currency papers on one machine, is being sold by its parent, Portals Papermaking Ltd. of the U.K. The mill has not operated for two years.

The exclusive producer of currency paper for the U.S. government is Crane & Co. Inc. of Dalton, Mass. ■

Nocopi disputes with Rolland over distribution

Nocopi International Inc. has cancelled contracts with Rolland Inc. that called for Rolland to distribute and promote Nocopi's paper products, which produce unreadable photocopies. Nocopi intends to file suit against Rolland, alleging that Rolland did not buy US$1.3 million worth of Nocopi paper by Dec. 31, as stipulated by a contract. Nocopi also says that Rolland failed to provide adequate funds to promote its paper in North America. Rolland says that it has honored the distribution contracts and that it intends to contest any lawsuit, while continuing to market and sell Nocopi paper.

Nocopi paper is a reddish color and produces unreadable copy when photocopied. Nocopi will now reportedly set up its own dealer network to serve niche markets in Canada and the U.S. It is also selling the paper in western Europe, New Zealand, Australia, and Argentina. ■

SPECIALTY PAPERS

Ivex purchases Petratex specialty paper mill

Ivex Corp. of Houston, Texas, has bought Petratex Paper Co.'s 55-tpd specialty kraft paper mill at Peoria, Ill., for an undisclosed amount. Petratex was formed in 1986 to buy the mill from Bemis Co. when it withdrew from primary paper manufacturing. The Peoria mill produces envelope stock; crêpe paper; flour sack paper; and colored, bleached, and natural kraft papers. Under Petratex management, the mill was also using some synthetic pulp supplied by Hercules Corp. for the production of label paper as well as other specialty grades.

Ivex does not currently plan to produce any products using synthetic pulp, but the Peoria mill's major production grades will complement the various grades of recycled chipboard, kraft core, and tube stock and waterproof papers, which Ivex produces at its 150-tpd Joliet, Ill., mill, said the company's CEO J.J. McCarty. Ivex also operates 16 paper and plastic packaging converting plants in the U.S. and Canada, which produce a wide variety of industrial, consumer, and disposable packaging. ■

CONSUMPTION OF PIGMENTS CONTINUES TO BE DRIVEN BY NEED FOR OPACITY

Industrial mineral and chemical market specialist discusses grades and paper industry consumption, sees major consumption trends

Currently, papermakers are able to select from a myriad of new mineral and chemical choices. To analyze the supply and demand picture for these materials, *Pulp & Paper* recently interviewed industry expert James J. Fallon, president of Fallon Research Associates Inc., New Providence, N.J. In particular, Fallon was asked to explain some of the changes and present some of the opportunities for the paper and industrial mineral industries. Fallon Research Associates is a market research and business development consulting company that has specialized in sophisticated raw materials used by a broad range of consuming industries, especially the paper industry. The company has produced multi-client reports on TiO_2, kaolin, $CaCO_3$, and other industrial minerals. Before forming Fallon Research Associates Inc., Fallon worked for 14 years with Engelhard Corp.

P&P: *What was the market value of industrial minerals consumed by the paper industry last year, and what do you see for the future?*

Fallon: Industrial minerals, including $CaCO_3$, kaolin, salt, sodium, talc, and other minor minerals, totaled 5 million tons (worth $460 million) in 1987. By 1993, the industry should be consuming 5.7 million tons (worth $650 million). This does not include TiO_2, which we consider a synthetic chemical.

P&P: *What were the most important of these minerals?*

Fallon: The most important minerals were what we call the pigmentary minerals, including TiO_2, kaolin, ground $CaCO_3$, and precipitated $CaCO_3$. Talc is used for pitch control and would not be included here.

P&P: *Having now identified the important minerals, how would you describe their consumption?*

Fallon: As illustrated in Table 1, consumption of all these minerals in 1988 (by the paper industry) will be worth $805 million, which will increase to $1 billion in 1993. TiO_2 is almost even with kaolin in dollar value consumed. By 1993, kaolin will exceed TiO_2. Both ground and precipitated $CaCO_3$ use are of the same order of magnitude now ($35 and $40 million, respectively). Precipitated use will be higher than ground use—$70 million to $55 million, respectively.

TABLE 1: **U.S. paper industry trends in mineral pigment consumption, 1988-93—printing and writing papers.**

Mineral	1988	1993
Titanium dixoide	370	405
Kaolin	360	515
Calcium carbonate (ground)	35	55
Calcium carbonate (precipitated)	40	70
Total	**805**	**1,045**

Freight on board, producers plant, all 1988 dollars.
Source: Fallon Research Associates Inc.

P&P: *What is the reason for these trends?*

Fallon: There are many crosscurrents in the selection of mineral pigments by grade of paper and board and furnish—groundwood and free-sheet. In the printing and writing segment, mineral pigments in their function of filling and coating differ with respect to their growth rates (Table 2). Regarding TiO_2, the U.S. has depended heavily on imported anatase, which has been the favored pigment in papermaking. Consumption of anatase from offshore and domestic sources will decline as a filler and even more strongly in coating use. The soft dollar makes imports more expensive. And there is more opacity per dollar in slurry rutile. This pertains only to free-sheet, since only small amounts are used in groundwood. These uses will remain unchanged.

Regarding kaolin, four general commercial grades of kaolin are used today (water-washed, delaminated, calcined and air float). No change is seen for air float used in free-sheet and groundwood.

Calcined kaolin is the new superstar of the industry. It had been used as a filler in free-sheet but more recently has gained acceptance in coating formulations. Application as filler in groundwood and in coated groundwood for catalog, directory (such as the *Yellow Pages*), and other publication grades could be a prosperous market for calcined kaolin. Ground and precipitated $CaCO_3$ are a threat to the kaolin filler business in alkaline conversions. The kaolin industry will succeed in developing ways to use kaolin with $CaCO_3$.

Regarding ground $CaCO_3$, regular grinds of $CaCO_3$ (i.e., 2+ microns) are used only in certain applications in coated board. The consumption pattern will not change for either groundwood or free-sheet. Ultrafine grinds continue to succeed in alkaline systems producing free-sheet. This $CaCO_3$ will tend to replace kaolin in these applications. But this type of $CaCO_3$ is also treated by satellite $CaCO_3$ plants. Nonetheless, we expect moderate growth in use of ultrafine $CaCO_3$ in filler and coating applications.

As for precipitated $CaCO_3$, the prospects for $CaCO_3$ plants that are remote from the paper mills are not as bright as for the satellite plants. There will be an impact on remote plants over the next five years. Satellite plants are doing very well. Four of them are now in operation or in the planning stages in the U.S. These should supply suitable filler grades for nearby mills, and coating grades will be available as well. Satellite plants do have a negative effect on consumption of ground $CaCO_3$ and kaolin.

P&P: *Of the four commodities you discussed, which ones seem to be the most promising?*

Fallon: If I could put a company together, I would select a product mix with slurry rutile, calcined kaolin with satellite $CaCO_3$ plants producing precipitated grades. The largest annual growth rates in the printing and writing papers area over the next five years will be in those three grades. The other commodities may do moderately well, and still others will have difficulties.

P&P: *What commodities would you least want to produce for the paper industry?*

Fallon: At the present time, although there may be opportunities in the future, the ground $CaCO_3$ business. It could be a more profitable business than it is, but price cutting and overcapacity have reduced its potential. However, a $CaCO_3$ plant in the right location could produce good profits.

TABLE 2: **U.S. paper industry mineral pigments consumption, 1988-93 (in US$000, figures are approximations)—printing and writing papers and coated board.**

	Groundwood		Free-sheet	
Mineral	**Filler**	**Coating**	**Filler**	**Coating**
Titanium dioxide				
Anatase, imported	No change	No change	Decrease	Decrease
Anatase, domestic	No change	No change	Increase	No change
Rutile	No change	No change	Increase	No change
Kaolin				
Water-washed	No change	Increase	No change	Increase
Delaminated	No change	Increase	No change	No change
Calcined	Increase	Increase	Increase	Increase
Air Float	No change	No change	No change	No change
Calcium carbonate, ground				
Regular	No change	No change	No change	No change
Ultrafine	No change	No change	Increase	Increase
Calcium carbonate, precipitated				
Remote	No change	No change	No change	No change
Satellite	No change	No change	Increase	Increase

Source: Fallon Research Associates Inc.

P&P: *What technological changes in the paper industry would benefit the pigments business?*

Fallon: We have already seen that adaptation to alkaline sizing by the fine paper or free-sheet segment has created opportunities for $CaCO_3$ in filler and coating applications. But this is a drop in the bucket compared with what the opportunities would be if the groundwood industry went alkaline. Technical problems make this almost impossible, but with alkaline sizing comes stronger fiber-to-fiber bonding and hence the possibility of using more filler. If U.S. partial alkaline production of groundwood papers or total application for free-sheet occurs by 1995, this would more than double the market for $CaCO_3$ and kaolin and perhaps add some impetus to the TiO_2 business.

P&P: *What is the most valuable property of these mineral pigments?*

Fallon: It would seem as though brightness has reached the limit and has satisfied everyone's expectations. There are high-brightness kaolin products, $CaCO_3$ is inherently bright, and TiO_2 has high brightness. Consumers have many choices if they are only seeking 90 GE. The products that customers pay the most for are ones with high opacity. That is the major contribution of TiO_2. Nothing except calcined kaolin has even partially replaced it for this application. If $CaCO_3$ had 90% opacity in addition to 95 GE brightness, it would take over the industry.

P&P: *What impact have machinery manufacturers had on coating formulations?*

Fallon: Many people do not realize the simplicity of this relationship. If you get a speed increase, capacity rises. You reduce the need for major capital projects (i.e., for new machines). Now, having said that, as the speed increases, viscosity of the coating becomes the critical factor. If the viscosity gets too high, there will be no "spreading" or penetration. You must have a coating with low viscosity and high solids. The chemists working for the mineral companies must try to produce a coating with low viscosity and high solids to increase machine speeds. If an 85% solids coating can be produced with a water-like viscosity, there is no predicting just how high machine speeds can go.

P&P: *What about the impact of polymers on the market?*

Fallon: When suppliers first shipped plastic pigments to the paper industry, they sold them as lightweight, bright, and opacifying agents for a broad range of grades. Their major target market was TiO_2 consumers. However, operating experience showed something they did not expect. They were producing sheets with a high gloss (a property the papermakers could sell to end users), especially for grades such as supercalendered papers. The images produced from these sheets were much better than what had been achieved before. ■

COATED PAPERMAKERS LOOK FORWARD TO CONTINUED GOOD TIDINGS IN 1988

Strong demand is helping absorb 800,000 tpy of new capacity as analysts soften their earlier forecasts of an economic recession

By ROB GALIN, News Editor

Coated paper markets are expected to remain relatively strong for the next several years as demand continues to absorb new capacity. Industry analysts suggest that operating rates at coated mills probably will average from 89% to 93% in 1988 and 1989.

These healthy markets may allow producers to raise prices beyond the high levels set in 1984 and 1985.

Demand for coated free-sheet papers appeared to be tapering off slightly at the end of the first quarter, prompting some mills to drop allocation programs on a few grades. This does not mean that the coated free-sheet market is weak, merely that it is loosening a bit. Prices have remained strong.

Producers of coated groundwood papers continue to benefit from an improving magazine market and a very healthy commercial printing sector. Magazines reported selling 3.1% more advertising pages in 1987 than in 1986, the Publishers Information Bureau said.

MILL SHIPMENTS RISE TO RECORD HIGHS. In 1987, U.S. mills increased shipments of all coated papers by 9.7% from 1986, to a record 6.87 million tons, the American Paper Institute reported. One mill source indicated that the strongest growth occurred in Nos. 1, 3, and 4 free-sheet grades, with some positive growth in No. 2. In the coated groundwood area, shipments of No. 5 rose about 7% in 1987, while No. 4 jumped 18%.

The API attributed the overall strength to increased orders from publishers of direct mail and newspaper inserts. Other strong growth areas reportedly include periodicals other than magazines, as well as converting grades. Areas of relatively small gains include book publishing and magazines, the mill source said.

New orders for coated grades rose 11.6% above 1986, and current allocation programs are mirrored in the tally of unfilled orders, which were up 48.4% from the previous year, according to the API.

Strong domestic demand also helped increase coated imports by 22.4% for 1987 compared to 1986, according to Dept. of Commerce figures. The beneficiaries of this demand primarily were the Canadians, who increased shipments to the U.S. more than twofold. Mills in Finland and Fed. Rep. Germany also increased sales to the U.S.

At the same time, the favorable dollar exchange rate boosted coated exports by almost 28.9%. Sources said that Canada imported over 50% more coated free-sheet paper in 1987 than in 1986.

Although coated paper shipments in Canada are not broken out by the Canadian Pulp & Paper Assn., one estimate put total coated paper capacity at 295,000 short tons in 1985, 400,000 in 1986 (not including Repap Enterprises' new machine), and 635,000 tpy by 1989. These figures include C1S bristol stock. Operating rates probably were in the high 80s or low 90s for the year.

Demand was met by the nearly 1 million tpy of new capacity brought online in North America in 1986 and 1987. This new tonnage, the anticipation of which caused severe price erosion in 1986 and early 1987, was soon absorbed by the markets, and mills were able to lift prices on all grades in the second half of 1987 and early 1988.

AVAILABILITY IMPROVES. Availability of both coated free-sheet and groundwood grades had improved slightly by the end of 1988's first quarter.

Magazine publishers reportedly built up inventories, as is normal that time of year, one mill source said.

In addition, catalog publishers are benefiting from a strong season and ordered paper in the first quarter in order to print and mail their pieces in advance of a mid-year mail rate hike.

With this strong market, an Apr. 1 pulp price increase, and the announced Apr. 1 price hikes for competing grades of uncoated groundwood papers, coated groundwood producers may feel the pull to raise prices. Several papermakers said that if an increase is announced, it probably would be implemented mid-year. Such a hike would raise prices beyond 1985 highs.

OUTLOOK FOR COATED GRADES. For the balance of the 1980s, overall coated paper demand probably will continue to grow somewhat above the real GNP.

Use of coated groundwoods by 98 of the most important magazine publishers in 1987 was estimated to be about 72% of total paper used, slightly higher than the 71.7% in 1986. Coated free-sheet paper may regain some lost ground, accounting for 10.6% of all paper consumed in 1987, after falling to 10.1% in 1986 from a higher rate of 10.8% in 1985. Magazine publishers consumed about 2.6 million tons of coated paper in 1987, sources said.

The catalog business also has been growing rapidly. Demand for catalogs increased 56% in 1986 from 1985, according to the Direct Marketing Assn. Simmons Market Research said that 51.2% of the U.S. population (87.7 million Americans) shops by mail, a 15% increase from 1985. Actual catalog production rose 18% in 1986, representing 11.8 billion pieces from about 6,500 publishers. Demand for coated papers for catalogs could reach over 2 million tons by 1990.

About 300,000 tpy of coated paper went into the book market in each of the years from 1984 to 1987. Book publishers purchased about 5.5% more coated stock in 1987 than they did in 1986. Total shipments of paper to book publishers grew 11.8%. Demand may grow as much as 5%/year for the remainder of the decade.

The other major market is commercial printing, with 2.9 million tons of coated paper going into that sector in 1987. Commercial printing uses about 40% of all coated paper production.

Included in that market are direct mail flyers and newspaper advertising inserts. It is estimated that the number of preprinted newspaper inserts are growing 5% to 7%/year, with coated paper usage for inserts to rise from about 400,000 tons in 1986 to 600,000 in the following four years. The rest of the approximately 2 million tons of insert paper is newsprint or uncoated groundwood grades.

Analysts predict that the coated free-sheet operating rates in 1988 will remain a healthy 92% to 95%, which is approximately the same as in 1986 and 1987. Output of coated free-sheet from U.S. mills rose about 10.8% in 1987 from the previous year, up from 1.7% growth in 1986. Growth in 1988 may be around 6.5%. Almost 3.1 million tons of coated free-sheet papers were shipped in 1987.

Coated groundwood production increased about 8.8% in 1987 from 1986, and analysts predict another 4.6% increase in 1988. Operating rates were 91.6% in 1986 and 1987 and may hit as high as 94% in 1988, though most analysts predict lower rates.

It is expected that demand for coated papers in the 1990s will be healthy, jumping to somewhere near 10 million tons in the U.S. alone. Canadian demand will reach several million tons. This means that imports into the U.S. will rise as well, with Scandinavia, Fed. Rep. Germany, and Canada serving as the major suppliers. Canada is also going to receive imports from Europe, Scandinavia, and the U.S.

The coated paper industry has recognized that one of the major threats to coated paper is supercalendered (SC) paper. The premium SC papers usually are offered for sale at around $100/ton less than lightweight coated paper. Other threats to the coated papers come from high-brightness uncoated groundwoods as well as from the new lightly pigmented Scandinavian grades that reportedly fall between SC and coated groundwood. ■

TABLE 1: **New North American coated paper capacity through 1990.**

Company	**Location**	**Annual short tons**	**Startup**
Westvaco[1]	Luke, Md.	150,000	1984–88
Bowater	Catawba, S. C.	200,000	1986
Consolidated Papers	Wisconsin Rapids, Wis.	200,000	1986
S. D. Warren/Scott Paper	Somerset, Maine	215,000	1986
International Paper	Pine Bluff, Ark.; Jay, Maine; Mobile, Ala.	300,000	1986
Champion International	Sartell, Minn.	175,000	1986
Dunn Paper[2]	Port Huron, Mich.	no increase	1987
Fraser Paper Ltd.	Madawaska, Maine	n.a.	1987–89
Mead	Escanaba, Mich.	no increase	1987
Simpson Paper	Pasadena, Texas	n.a.	1987–90
Midtec Paper/Repap Enterprises[3]	Kimberly, Wis.	205,000	1988
S. D. Warren/Scott Paper	Muskegon, Mich.	n.a.	1988
S. D. Warren/Scott Paper	Westbrook, Maine	n.a.	1988
Blandin Paper	Grand Rapids, Minn.	254,000	1989
Potlatch	Cloquet, Minn.	no increase	1989
Champion International	Bucksport, Maine	n.a.	1989
Champion International	Quinnesec, Mich.	265,000	1990
Weyerhaeuser Paper Co.	Columbus, Miss.	n.a.	n.a.
Company, Canada		**Annual metric tons**	
Repap Enterprises	Newcastle, N. B.	190,000	1986
Kruger[4]	Trois Rivieres, Que.	77,000	1986
Makin Pulp & Paper[5]	Britannia Beach, B. C.	58,000	1987
Repap Enterprises	Newcastle, N.B.	190,000	n.a.

n.a. = not available

1. Incremental additions
2. Division of James River Corp.
3. 100,000 tpy net
4. New coater to use paper from existing paper machines.
5. Combination of coated and uncoated free sheet.

Source: *Pulp & Paper Week, Pulp & Paper Project Report.*

RECYCLING

U.S MILLS' WASTEPAPER CONSUMPTION TO GROW 7.3% THROUGH 1990, API SAYS

Survey shows that old newspapers, OCC, and mixed paper will be very much in demand as new waste-based mills come onstream

By REGINA McGRATH, News Editor

Between 1988 and 1990, U.S. paper and board mills' consumption of recyclable paper is expected to grow 7.3%, from 20.05 million short tons to 21.52 million tons, according to the capacity survey recently released by the American Paper Institute. Wastepaper consumption in 1987 (including use in molded pulp products and construction grades) reached 19.6 million short tons by year-end.

The fiber mix at U.S. mills is not expected to change appreciably through 1990. Approximately 55% of the fiber consumed by paper and board mills will be secondary fiber, and 45% will be primary fiber (100% virgin woodpulp). In the secondary fiber category, however, recyclable paper consumption will increase by about a percentage point, to 25.4% of the total fiber consumed, the API reports.

Mills in the U.S. are continuing to consume more old corrugated containers (OCC) than any other grade of wastepaper. The API projects that U.S. mills will consume approximately 9.8 million tons of OCC in 1988, and consumption is expected to increase by 7.7% to 10.5 million tons by 1990. The API attributes part of this increase to the fact that more producers of unbleached kraft linerboard are planning to use corrugated container waste in their furnishes. By 1990, unbleached and bleached kraft board mills are expected to consume in the area of 2.46 million tons of corrugated container waste.

For the first half of 1988, containerboard mills are expected to run near capacity, fueling demand for OCC and new double-lined kraft corrugated clippings. In the long term, U.S. capacity for unbleached kraft linerboard is expected to grow by 6.2% between 1988 and 1990, although corrugating medium (both semichemical and recycled) will show slower growth. Tight markets for virgin grades is stimulating interest in recycled containerboard. International Paper Co. is studying possible reactivation of the idle Durham recycled containerboard mill in Riegelsville, Pa., using "world-class recycling technology not currently available in the U.S."

Growth in recycled paperboard capacity will be marginal—inching up 0.9% between 1988 and 1990. Recycled paperboard mills will consume 54% of the corrugated waste by 1990—a decrease of about 2% from 1988. These mills also consume about 74% of the mixed paper waste in the U.S. Total U.S. consumption of mixed paper is expected to grow 3.8% between 1988 and 1990 to 2.15 million tons.

Demand for old newspapers will grow more than any other grade. Between 1986 and 1987, consumption at U.S. mills increased 13.4% to 3.56 million tons. Prior to this surge in consumption, demand for old newspapers was expected to grow 9.0% between 1988 and 1990, but this may be understating the case in light of the record consumption of 1987 and the fact that several companies expect to start up newsprint machines during the period. These startups include a recycled machine at Southeast Paper Manufacturing Co. in Dublin, Ga., which has already said it will double its consumption of old newspapers. In 1990 newsprint mills will consume about 44% of all the old newspapers in the

TABLE 1: **Wastepaper consumption at U.S. paper and board mills increased 9.7% in 1987, while collections rose by 11%.**

	Consumption at U.S. paper and paperboard mills[1]	% change (1986-87)	Exports	Total collected
News	3,560,300	13.3	870,240	4,430,540
Corrugated	9,298,900	7.1	1,921,679	11,220,579
Mixed	2,101,100	3.6	738,104	2,839,204
High grade	4,656,500	15.4	892,313	5,548,813
Total[2]	**19,616,800**	**9.7%**	**4,422,336**	**24,039,136**

1. Includes consumption at plants making molded pulp and insulation products.
2. All totals in short tons.
Source: American Paper Institute.

U.S., while recycled paperboard mills will consume about 40.1%. This compares with projections of 42.4% and 41.8%, respectively, for 1988.

Consumption of pulp substitutes is expected to grow by 5.5% between this year and 1990, rising from 3.0 million tons to 3.2 million tons. During the first quarter of this year demand for pulp substitutes is expected to increase since more mills will use this grade in their furnish rather than buy increasingly expensive market pulp. By 1990 printing/writing paper mills will consume about 33.5% of the pulp substitute grades; tissue mills, 24.9%; and recycled board mills, 28.6%. This compares with 34.1%, 24.0%, and 28.3%, respectively, in 1988.

The API estimates that U.S. mills will consume about 1.8 million tons of deinking grades this year. Consumption is projected to increase by 3.8% to 1.9 million tons by 1990. In 1990 tissue mills are projected to consume about 64.6% of the high-grade deinking stocks. However, this does not include Wisconsin Tissue Mills Inc.'s recently announced plan to increase its capacity for recycled tissue by 80,000 tpy (*P&P*, Jan. 1988, p. 33). Nor does it appear to include Fort Howard Corp.'s third recycled tissue machine at its Savannah River mill in Rincon, Ga., which is scheduled to come onstream in late 1989. The company is also applying for a permit for a recycled tissue machine at its Green Bay, Wis., mill.

EXPORT DEMAND STRONG. The weak dollar and high pulp prices boosted exports of U.S. wastepaper last year, which totaled 4.4 million tons—an 18% increase over 1986. This year, paperstock exports are expected to reach at least 4.5 million tons. Most wastepaper suppliers anticipate a strong export market, at least during the first half of this year. Pulp substitute exports will be strong as more offshore mills trade down to these grades because of the Jan. 1 price increase on market pulp.

At a meeting held toward the end of last year by western Europe's Bureau International de Recuperacion (BIR), most country representatives predicted strong markets for the first part of this year. One of the main concerns is that Fed. Rep. Germany is said to subsidize waste haulers to encourage household recycling. The European Economic Community may investigate these subsidies as a result of a complaint filed by the BIR.

This is of concern to U.S. paperstock exporters because Fed. Rep. Germany is beginning to step up its exports to the Far East. The main importers of U.S. wastepaper are Rep. Korea and Taiwan, with Japan playing a lesser, but significant, role. ■

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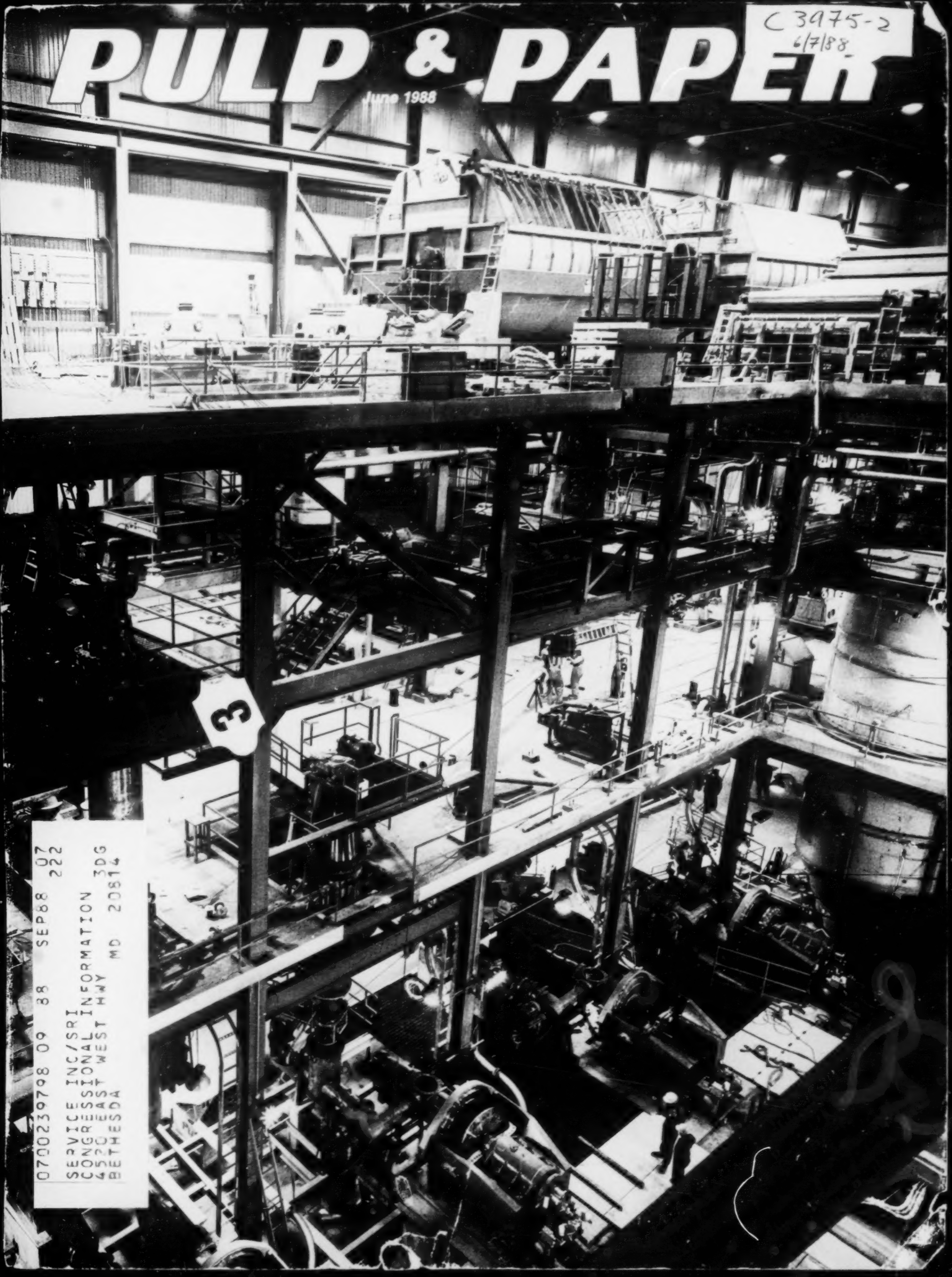

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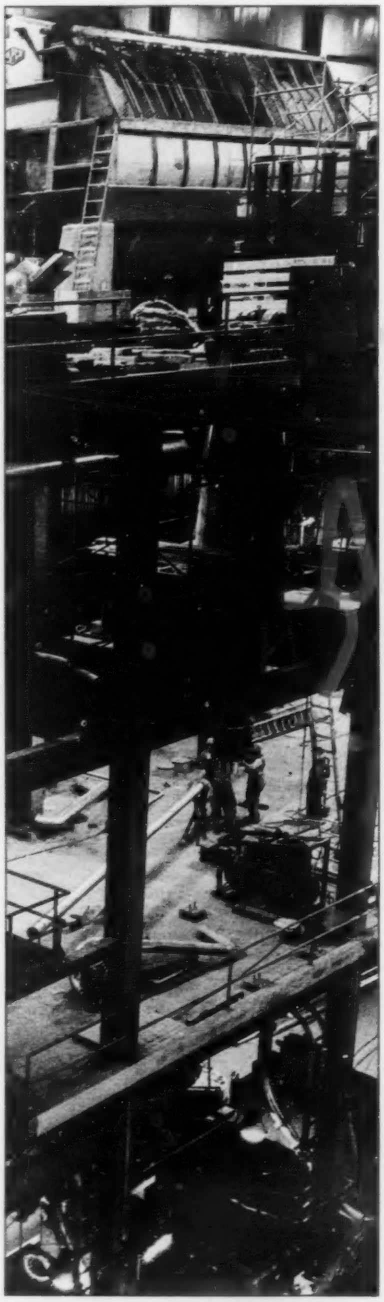

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News, Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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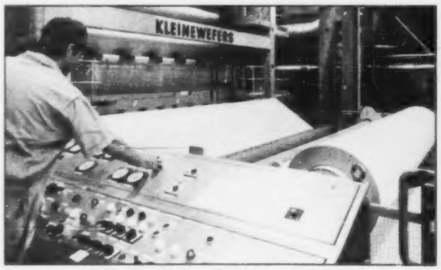

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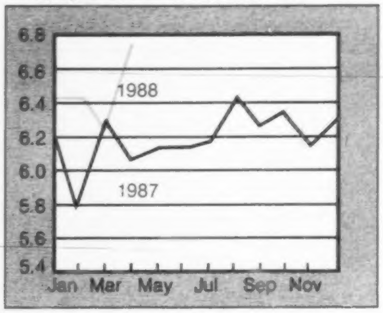
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled a record 6.7 million tons in March, up 7.1% from March 1986, according to American Paper Institute data. On a seasonally adjusted basis, the production rate for the first quarter was 76.8 million tpy, up 5.3% from the pace set in the first quarter of 1986. Paper production was at a seasonally adjusted 38.5-million-tpy rate, up 5.9%, and paperboard at 38.4 million tpy, up 4.6%.

Among major grades, printing and writing papers were up 9.9% in March from a year earlier, mostly on the strength of continued year-over-year gains for coated papers and uncoated free-sheet. Demand was strong from publishers and commercial printers. Containerboard production for domestic use rose 6.3% for the first quarter, and production of unbleached kraft linerboard for export climbed 21.0%. Unbleached kraft linerboard exports declined 16% in February.

Canadian newsprint shipments totaled 881,000 metric tons in March, up 4.1% from the previous year, according to the Canadian Pulp & Paper Assn. Woodpulp shipments declined 5.6% to 748,000 tons. Operating rates continued virtually at capacity for both newsprint and pulp. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	March	510	7.4	5,950	5.8
Uncoated groundwood (s)	March	142	2.9	1,582	-0.7
Coated paper (s)	March	653	19.2	7,522	14.9
Uncoated free sheet (s)	March	1,019	10.9	11,522	9.6
Other printing/writing	March	128	8.5	1,477	6.0
Total packaging and other paper (s)	March	454	1.3	5,316	0.2
Tissue	March	474	6.3	5,428	4.3
Total paper	**March**	**3,380**	**9.4**	**38,797**	**7.0**
Unbleached kraft paperboard	March	1,696	8.8	19,595	8.2
Semichemical medium	March	492	0.2	5,739	1.6
Bleached paperboard	March	388	-0.5	4,537	1.6
Recycled paperboard	March	774	2.7	8,965	5.8
Total paperboard	**March**	**3,349**	**4.9**	**38,831**	**5.9**
Total U.S. paper and paperboard output	**March**	**6,730**	**7.1**	**77,628**	**6.5**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	Feb.	4,920	6.6	61,175	5.4
Market pulp production	Feb.	687	15.5	8,458	11.7
Wastepaper consumption at paper/board mills	Feb.	1,504	9.0	18,430	5.4
Pulpwood consumption (cords)	Feb.	7,743	2.7	95,796	2.4
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft^2)	March	27.222	9.5	76.778[6]	6.1
Containerboard inventories at U.S. box plants and mills	Mar. 1	2,589	8.3		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	Feb.	1,021	5.3	12,275	0.3
Imports of Canadian newsprint	Feb.	675	0.3	8,304[6]	-4.5
U.S. paper exports (including products)	Feb.	455	9.6	5,681	14.8
Exports of unbleached kraft linerboard	Feb.	168	-18.0	1,908	-15.8
Exports of woodpulp	Feb.	444	19.4	5,009	23.1
Norscan pulp inventories[4]	Mar. 31	805	-7.2		
Norscan pulp operating rates[4]	March	102%	101%	101%	101%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	March	881	4.1	2,379[6]	1.1
Operating rates	March	100%	100%	100%	100%
Inventories held by U.S. consumers	Mar. 31	1,521	11.3		
Other paper/board shipments	March	589	7.5	1,642	4.2
Woodpulp shipments (export only)	March	748	-5.6	2,003	0.5
Operating rates	March	99%	98%	98%	98%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Recycled paperboard: Prices are improving

Grade Structure: Recycled paperboard is made primarily from secondary fiber and is produced on either a fourdrinier, multi-ply, or cylinder paper machine. Grades include folding boxboard, corrugating medium, linerboard, gypsum liner, and core/can/tube stock.

Markets: Market demand for recycled paperboard grades, as measured by their 1988 capacity share, is as follows: folding boxboard, 28.5%; setup boxboard, 2.9%; corrugating medium, 18.6%; gypsum linerboard, 14.8%, linerboard, 6.2%; container chipboard and filler board, 0.5%; core/can/tube stock and other paperboard, 28.5%.

Production/Capacity: Production increased 6.3% to 8.60 million short tons in 1987. Demand continued to be strong in early 1988, with total recycled boxboard production ahead 6.1% through the first two months compared with a year earlier. Capacity increased just 2.7% in 1987. Mills operated at about 93% of capacity, compared with about 90% in 1986. This year, capacity is expected to rise 2.1% to 9.45 million tons while demand is to increase at a slower 1.6% rate.

An additional 277,000 tons of capacity is scheduled for startup by 1990, mostly in the corrugating medium, linerboard, and folding boxboard grades. These expansions include the conversion of two paper machines that previously produced other products to the manufacture of recycled paperboard, as well as more than twenty machine rebuilds and restarts in the industry.

Outlook: Recycled paperboard continues to show surprising strength across the board, with all major grades showing improvement in 1988. The strongest growth areas were recycled linerboard and corrugating medium.

Demand for gypsum liner is expected to weaken slightly in 1988 due to a slowdown in general construction activity. Core/can/tube stock should fare slightly better, as the country's overall industrial production remains steady in 1988. Setup boxboard demand should also remain healthy this year due to continued interest in specialty products.

Producers of recycled boxboard for folding cartons increased output by 5.4% in 1987. The increasing prices for solid bleached sulfate (SBS) grades were also partially responsible for some substitution of clay-coated recycled grades for SBS, which gained only 4.2% in 1987. Continuing strong demand for consumer packaging and rising prices for SBS have benefited recycled boxboard producers early in 1988. However, total folding carton demand is forecast to grow only 1.5% in 1988.

Prices: Prices for recycled folding carton stock improved considerably throughout 1987 and into the first half of 1988.

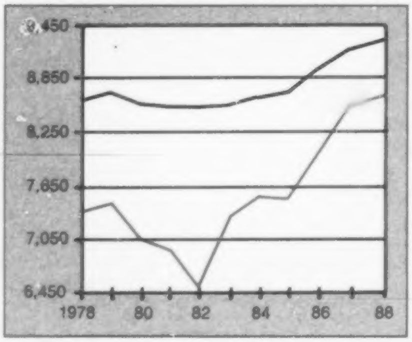
This year, producers raised prices $20 to $30/ton for recycled folding carton grades during the first quarter. This raised transaction levels for 20-point clay-coated grades to about $420 to $440/ton in the East, $440 to $460/ton in the Midwest, and as high as $490/ton in the West. Uncoated chipboard prices increased to about $350/ton. Most producers have announced another $25 to $30/ton price increase for June and July.

Despite the improvement of prices over the past two years, several major producers have sold all or portions of their recycled paperboard businesses because of poor profitability.

Price trends ($/short ton, year-end) for clay-coated 20-point folding carton boxboard (rolls) are as follows: 1975, $257; 1976, $262; 1977, $284; 1978, $305; 1979, $355; 1980, $380; 1981, $400/$425; 1982, $380/$425; 1983, $370/$425; 1984, $375/$425; 1985, $350/$400; 1986, $380/$420; 1987, $400/$440. Bending 20-point chipboard (rolls): 1975, $204; 1976, $212; 1977, $219; 1978, $225; 1979, $260; 1980 $260/$275; 1981, $270/$280; 1982, $280; 1983, $280/$300; 1984, $300; 1985, $300; 1986, $320; 1987, $330.

Correction. The April 1988 Grade Profile discussing uncoated freesheet should be revised to exclude bristols capacity for International Paper Co., 1.9 million tons (16.1%), and Champion International Corp., 1.2 million tons (10.2%), lowering market share of the top five companies to 48.8% and the top ten to 74.9%.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1986	1987e	1988e
Production	8,083	8,594	8,736
Capacity	9,008	9,252	9,446
Utilization rate	89.7	92.9	92.5
Imports	95	151	143
Exports	70	60	67
Apparent U.S. consumption	8,108	8,685	8,812
lb/capita	67.33	71.46	71.85
GNP ratio[1]	2.18	2.26	2.26

e = Estimate.

1. 1,000 tons/$billion real GNP.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. Jefferson Smurfit[1]	1,220	12.9
2. Sonoco Products[2]	750	7.9
3. Newark Group	610	6.5
4. Rock-Tenn[3]	532	5.6
5. Caraustar	480	5.1
6. Inland Container	475	5.0
7. Waldorf	380	4.0
8. U.S. Gypsum	377	4.0
9. National Gypsum	320	3.4
10. Packaging Corp.	210	2.2

Market share of top five companies:
38.0%

Market share of top ten companies:
56.6%

Total U.S. capacity (1988):
9.446 million short tons

1. Reflects completed merger with Container Corp. of America.
2. Acquired Federal's Richmond, Va., mill in 1988.
3. Acquired Mead's Lynchburg, Va., Cincinnati, Ohio, and Otsego, Mich., mills in 1987.

Publication papers strong. Mead Corp. characterized its first-quarter results as "far and away the best first quarter in our history." The company observed that although its production reached record levels, backlogs were continuing to increase in several major product lines and prices have strengthened.

Bowater Inc. had record sales and earnings for the quarter. It had the biggest increase in profits of any firm surveyed and has announced new capital spending plans.

Boise Cascade Corp. enjoyed record profits for the quarter, thanks to successful price increases on every major grade of paper produced by the company. Chairman and CEO John Fery expects a record performance for the company in 1988. Boise is planning to spend $400 million on capital projects in 1988—a 50% jump over 1987.

Tissue producers gain. Scott Paper Co.'s sales and income both reached record levels for the first quarter. The profits from Scott's U.S. tissue operations (both consumer and commercial) rose 23% on a 13% increase in sales. Recently announced price increases on both consumer and commercial tissue products will help second-quarter results.

James River Corp.'s profits rose 18% for the quarter. The company said substantial earnings increases occurred in the communication papers, paperboard packaging, and specialty papers business. Earnings for the towel and tissue segment and the disposable food service business were flat due to competitive market conditions. Profits decreased in the flexible packaging business, primarily due to lags in passing through continued rapid increases in plastic resin costs, James River said.

Fort Howard Corp. enjoyed a 52% increase in earnings despite rising prices for wastepaper and polystyrene resin. The company said its national account sales of food service and disposable products are recovering. ■

U.S. paper industry results.

	First quarter ($000)			
Companies	**Sales**	**Change 1988/87**	**Earnings**[1]	**Change 1988/87**
Boise Cascade Corp.	$ 1,016,310	11.4%	$ 68,540	70.7%
Bowater Inc.	343,140	21.7	37,974	221.5
Champion International	1,266,070	15.4	101,974	83.8
Chesapeake Corp.	161,297	3.8	9,900	133.9
Consolidated Paper Corp.	231,067	32.1	39,526	79.8
Federal Paper Board Co.	245,501	6.8	21,868	100.0
Fort Howard Paper Co.	426,859	8.3	36,296	52.1
Georgia-Pacific Corp.	2,115,000	14.0	106,000[2]	32.5
P.H. Glatfelter Co.	136,147	85.3	18,362	49.9
Great Northern Nekoosa Co.	843,900	48.9	78,300	80.8
International Paper Co.	2,300,000	27.8	159,000[2]	76.7
James River Corp. (1/21)	1,237,725	17.0	49,213	18.0
Jefferson Smurfit Corp.	312,960	22.3	32,407	121.0
Kimberly Clark Corp.	1,294,000	9.4	93,000	24.2
Longview Fibre Corp. (1/31)	137,131	3.2	16,435	16.9
Louisiana-Pacific Corp.	483,000	14.2	30,800[2]	89.0
Mead Corp.	1,085,300	13.4	65,800[2]	92.4
Mosinee Paper Corp.	58,932	16.4	1,636	73.1
Pentair Inc.	194,336	−1.7	8,883	142.8
Pope & Talbot Inc.	115,731	15.4	7,957	19.6
Potlatch Corp.	258,220	3.9	26,495	49.0
Scott Paper Co.	1,126,400	17.7	74,000	51.0
Sonoco Products Co.	376,212	51.6	22,250	45.5
Stone Container Corp.	881,300	50.4	65,300	150.2
Temple-Inland	425,700	9.0	45,600	35.3
Union Camp Corp.	645,389	18.6	67,554	52.8
Wausau Paper Mills Co. (2/29)	68,405	13.2	3,566	29.0
Westvaco Corp. (1/31)	501,330	13.7	37,644	93.1
Weyerhaeuser Co.	1,855,462	14.7	114,193	12.0
Willamette Industries Inc.	404,757	25.3	40,376	76.0
Total	**$20,547,581**	**18.6%**	**$1,481,149**	**58.5%**

1. Income after taxes from continuing operations, excluding most significant nonrecurring items in both years.

2. **Georgia-Pacific Corp.**: 1987 quarter excludes a $6-million pretax gain from liquidation of investments. **International Paper Co.:** 1987 quarter includes a $14-million pretax gain from the sale of securities. **Louisiana-Pacific Corp.:** 1988 quarter excludes nonrecurring gains of $146.0 million from settlement of timberland dispute and $15.7 million from sale of the Container Products Div. of Fibreboard Corp. **Mead Corp.:** 1988 quarter includes an $11-million gain from sale of recycled board business.

Canadian profits up 41%, but currency squeezes profits

Canadian forest products companies enjoyed a 41.6% increase in profits on a 10.9% increase in sales. Unlike their U.S. counterparts, however, Canadian producers were not so optimistic about the prognosis for 1988, primarily because the appreciating Canadian dollar is making the U.S. market a less-profitable place for Canadians to do business. Ongoing labor negotiations at pulp, paper, and sawmills in British Columbia also have some companies feeling uneasy. Pulp and newsprint markets remain tight, and several companies have committed to big capital spending agendas.

During March and April, the Canadian dollar averaged about 81¢ compared with the 76¢ it was worth in fourth-quarter 1987. For all of 1987 the Canadian dollar's average worth was 75.5¢ to the U.S. dollar—a 4.9% increase over 1986 levels. Canadian companies are doing something about their dependence on the U.S. by expanding offshore. Abitibi-Price Inc., Noranda Forest Inc., and Consolidated-Bathurst Inc. are pursuing investments in Australia, Venezuela, and People's Rep. China, respectively.

Adam Zimmerman, chairman of Noranda Forest Inc., said that he expects the current strong market conditions to generally continue throughout 1988. Noranda's profits were 49% above the 1987 quarter. The 54-day strike at the Thurso, Que., mill and the strong Canadian dollar reduced the company's profits by C$10 million. Zimmerman noted that "there is every reason for optimism that labor negotiations will be concluded amicably and promptly."

Abitibi-Price Inc. reported that its earnings were more than double the 1987 quarter. Chairman and CEO Bernd Koken told shareholders that the company's newsprint group was benefiting from the price increase implemented at the beginning of 1988. He also cited improved contributions from the groundwood papers, coated papers, and distribution operations. Koken said he was optimistic Abitibi would achieve solid earnings growth in 1988 but admitted he was concerned about the detrimental effect of a strengthening Canadian dollar.

MacMillan Bloedel Ltd., which is 50% owned by Noranda Forest, enjoyed a 52% improvement in earnings. Earnings were helped by first-quarter price increases for newsprint, pulp, and linerboard. Prices for premium lumber grades, especially offshore, have also been strong. These factors helped to offset higher log costs, a higher Canadian dollar, and lower-than-planned newsprint production due to maintenance and startup projects.

Domtar Inc. reported earnings fell about 16%, mainly due to a significant decline in results from construction materials due to lower U.S. prices for gypsum wallboard. Profits were hurt by the strike at the hardwood pulp mill in Lebel-sur-Quevillon, Que., which began in February. Domtar said the strike rendered it unable to capitalize on strong pulp markets and hurt the Fine Paper Div., which experienced pulp shortages.

Consolidated-Bathurst Inc. saw its earnings increase 61% in the quarter on a 9.3% increase in sales. The company said improved prices in most product lines offset lower shipments of newsprint in the first quarter and the effects of the strong Canadian dollar. Con-Bath said profits were helped by its Bridgewater Paper Co. Ltd. subsidiary, which is now the largest newsprint supplier in the U.K.

British Columbia Forest Products Ltd. enjoyed the highest quarterly earnings in its history. CEO Ian Donald characterized the short-term outlook as "bullish" but warned that an "aggressive reinvestment program is necessary to keep the company competitive." BCFP and its affiliates plan to spend a record C$1 billion on projects to "stay internationally competitive in this global business." Donald noted that the rising value of the Canadian dollar "jeopardizes the company's ability to compete in offshore markets and added that the effect of each 1¢ increase in its value results in a $5-million reduction in earnings for BCFP." ■

Canadian paper industry results.

	First-quarter 1988 (C$000)			
Companies	**Sales**	**Change 1988/87**	**Earnings[1]**	**Change 1988/87**
Abitibi-Price Inc.	$800,000	15.0%	$44,100	101.4%
B.C. Forest Products	356,000	6.0	45,400	38.8
Canfor Corp.	295,100	0.1	29,000	40.1
Cascades Inc.	140,000	8.5	7,400[2]	15.6
Consolidated Bathurst Inc.	562,600	9.3	53,100	60.9
Domtar Inc.	673,000	11.4	37,000	−15.9
Donohue Inc.	155,900	40.6	15,100	88.8
Great Lakes Forest Products	209,052	14.2	33,497	70.4
MacMillan Bloedel Ltd.	796,500	10.7	91,600	51.7
Noranda Forest Inc.	1,075,000	8.1	62,900	49.1
Repap Enterprises Corp. Inc.	256,100	10.9	18,100	42.5
Rolland Inc.	114,600	20.4	1,775	17.8
Scott Paper Ltd.	81,923	8.7	3,946	8.1
Weldwood of Canada Ltd.	208,925	16.0	15,538	20.8
West Fraser Timber	102,000	10.0	11,100	−7.5
Total	**$5,846,700**	**10.9%**	**$469,556**	**41.6%**

[1] Income after taxes, from continuing operations, excluding most significant nonrecurring items in both years.

[2] **Cascades:** 1988 figures are preliminary company estimates.

EXPANSIONS

Repap to install new coated unit and pilot pulp mill

Repap Enterprises Corp. Inc. of Montreal, Que., announced that it will build a second coated paper machine at its Miramichi pulp and paper mill in Newcastle, N.B. The company also said it will build an ethanol-based pilot pulp mill at the mill. The two projects are expected to cost about C$435 million.

The new machine will have capacity for between 200,000 and 260,000 metric tpy of coated paper, depending on what grade is made. It will more than double the facility's coated paper capacity, Repap said. The unit will be able to produce both coated groundwood and coated free-sheet paper. The company said financing arrangements are being finalized. Repap installed a 220,000-metric-tpy lightweight coated groundwood machine at the mill in summer 1986. The mill currently has capacity for about 550 tpd of bleached and unbleached kraft market pulp. The new machine comes onstream late next year. Repap also plans to install a low-odor chemical recovery boiler at Miramichi to recover chemicals and burn byproducts in order to produce steam and electricity.

Repap is also in the process of installing a 205,000-short-tpy coated free-sheet paper machine at its Midtec Paper Inc. subsidiary in Kimberly, Wis. Startup is slated for September. The machine will replace some older units.

Construction starts on pulp line. In addition to these expenditures, Repap said it will spend about C$45 million to install a pilot pulp plant and associated R&D facilities at Miramichi. Operating costs of the ethanol-based pulp line will come to about $20 million. The Canadian government has committed to contributing half of the total cost of the project as long as certain conditions are met. The pilot plant will use Repap's proprietary Alcell ethanol-based pulping process and will have capacity for about 11,000 metric tpy. Startup is slated for first-quarter 1989.

The pilot plant is the culmination of years of research by Repap. The Alcell process does not use sulfur to separate the lignin from the cellulose. Rather, the woodchips are placed in an ethanol and water solution and

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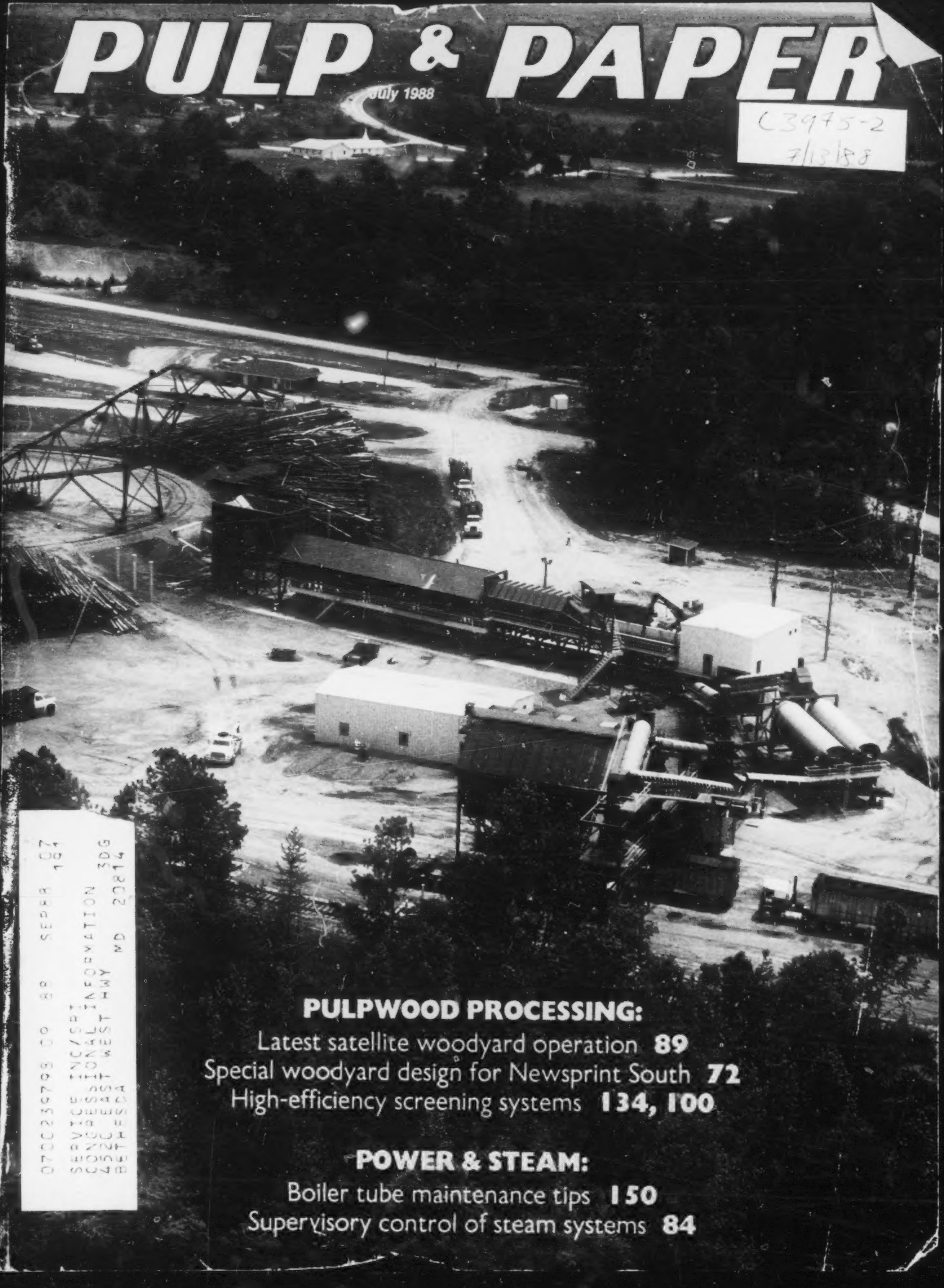

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.

POSTMASTER: Please send Form 3579 to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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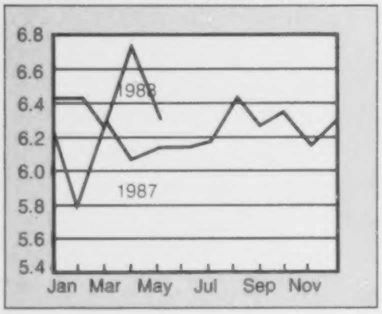
MONTH IN STATISTICS

U.S. paper and board production



U.S. production of paper and paperboard totaled 6.3 million tons in April, an increase of 3.8% over April 1987, the American Paper Institute said. The seasonally adjusted production rate was 76.8 million tpy, up 5.0% from last year. The production rate was up 6.0% for the paper sector and 4.1% for paperboard. First-quarter trade statistics from the Census Bureau showed paper and paperboard exports up 18.9% from a year earlier, the result of a weak U.S. dollar. Imports climbed 4.0%. Pulp exports grew 15.3% in the first quarter, while imports declined 2.4%.

Among major grades, printing and writing papers continued to perform strongly, with production up 9.5% from April 1987. Coated papers was the most heated sector, with both production and new orders up about 14% from a year earlier. Reflecting continued strength in manufacturing, the Fibre Box Assn. reported a new record for April shipments, and containerboard production for domestic use jumped 5.5% from last year.

Canadian newsprint shipments dipped 3.5% in April to 789,000 metric tons, while woodpulp exports rose a sluggish 0.8%, to 628,000 tons. Operating rates stood at 99% for newsprint and 94% for pulp. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	April	497	7.6	5,954	6.2
Uncoated groundwood (s)	April	129	7.5	1,582	2.2
Coated paper (s)	April	609	11.1	7,476	13.9
Uncoated free sheet (s)	April	945	4.3	11,477	8.3
Other printing/writing	April	134	12.6	1,543	11.1
Total packaging and other paper (s)	April	438	3.1	5,302	0.9
Tissue	April	444	3.5	5,402	3.9
Total paper	**April**	**3,196**	**6.2**	**38,736**	**6.9**
Unbleached kraft paperboard	April	1,529	2.5	19,284	6.9
Semichemical medium	April	447	-3.5	5,645	0.5
Bleached paperboard	April	377	3.0	4,492	1.2
Recycled paperboard	April	754	1.8	8,962	6.5
Total paperboard	**April**	**3,107**	**1.5**	**38,383**	**5.0**
Total U.S. paper and paperboard output	**April**	**6,303**	**3.8**	**77,118**	**5.9**
PULP, WASTEPAPER & FIBER[2]					
Total U.S. woodpulp production	March	5,230	4.1	61,700	5.1
Market pulp production	March	730	6.4	8,558	9.8
Wastepaper consumption at paper/board mills	March	1,624	9.4	18,782	5.3
Pulpwood consumption (cords)	March	8,249	4.8	96,860	3.2
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	April	26.053	1.6	102.868[6]	4.9
Containerboard inventories at U.S. box plants and mills	April 1	2,513	4.1		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	March	1,173	10.3	12,876	3.7
Imports of Canadian newsprint	March	785	7.8	8,677[6]	-0.3
U.S. paper exports (including products)	March	537	25.8	5,937	18.5
Exports of unbleached kraft linerboard	March	222	18.7	2,159	-4.3
Exports of woodpulp	March	491	4.2	5,302	15.3
Norscan pulp inventories[4]	April 30	821	-10.1		
Norscan pulp operating rates[4]	April	95%	102%	101%	100%
CANADIAN STATISTICS[5] *(reported in metric tons)*					
Total newsprint shipments	April	789	-3.5	3,167[6]	-0.1
Operating rates	April	99%	99%	100%	99%
Inventories held by U.S. consumers	April 30	1,525	12.1		
Other paper/board shipments	April	469	-12.3	2,209	4.6
Woodpulp shipments (export only)	April	628	0.8	2,632	0.6
Operating rates	April	94%	99%	97%	98%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Bleached paperboard: Solid market demand and strong price performance continue

Grade structure: Solid bleached sulfate (SBS) is used primarily for folding carton and milk carton packaging and is produced from a furnish containing no less than 80% virgin bleached woodpulp. Other uses include cup and plate stock, round nested food containers, and linerboard. Calipers range from 10 to 28 points, in low-, medium-, and high-density, and basis weights vary from 120 to 300 lb/3,000 ft². Most of the SBS produced is either clay-coated or polyethylene-coated.

Markets: Market demand for bleached paperboard grades, as measured by their 1988 capacity share, is as follows: folding boxboard, 52.0%; milk carton and food service, 41.3%; linerboard, 2.9%; and other packaging, 3.8%.

Production/capacity: Production in 1987 was up 3.2% to 4.40 million tons, which was a record production level, according to the American Paper Institute. Operating rates improved to 94.2%, slightly higher than the 93.3% level recorded in 1986. Exports accounted for 564,000 tons, or 12.8% of production.

Among the major end uses, production of folding carton stock increased by 3.5%, milk carton stock increased 5.7%, food service products declined by 2.4%, and other packaging uses increased 1.7%.

Capacity increases have averaged 1.5% annually during the past ten years, highlighted by the startup of a new 175,000-tpy SBS paperboard machine at Westvaco Corp.'s Covington, Va., mill in 1986. No new machines are planned through the remainder of the 1980s, so capacity gains will come mainly from machine improvements and modernizations. These improvements are expected to increase the industry's capacity by 191,000 tons, or 1.3% annually, to a total of 4.87 million tons by 1990.

Outlook: Bleached paperboard consumption is expected to increase slightly this year, reflecting the steady demand for consumer packaging. Production is forecast to rise 1.9% to 4.49 million tons, and operating rates should remain at about 94.2%. Supply has been tight throughout the year because many companies have taken downtime to rebuild or modernize their paperboard machines. As much as 25,000 tons of production capacity was lost during the first half of 1988 as a result of downtime at Federal Paper Board Co., International Paper Co., Potlatch Corp., and Weyerhaeuser Co.

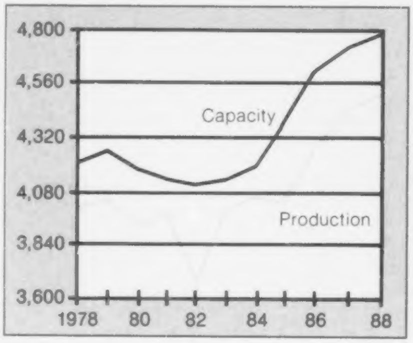
Folding carton demand should hold up through the end of the year as the possibility of a recession in 1988 diminishes. The proliferation of new consumer products, as well as the repackaging of older, established products, will fuel the demand for paperboard packaging. Milk carton demand has also been strong: producers continue to introduce new liquid packaging applications, and market share loss to plastics is easing. The most promising new market remains aseptic packaging, with International Paper Co. as a leading producer of this specialized type of board.

Disposable food service packaging will be in high demand from both fast-food restaurants and individual consumers this year. In recent years, the traditional disposable products of cups, plates, trays, and food containers have been joined by "microwavable" trays and containers in the convenience food market. Both Westvaco Corp. and James River Corp. have been major innovators of microwavable packaging.

Prices: Two price hikes were successfully implemented in April and October 1987, and producers raised prices again in April this year. The primary reason for this upward price trend has been the nearly two-year climb in pulp prices. Higher costs for polyethylene (PE) coatings and tight market conditions have also contributed to the price increases. Another increase later this year is expected if pulp prices continue escalating and market conditions remain firm.

Clay-coated 15-point folding carton boxboard (rolls), $/short ton, year-end: 1973, $300; 1974, $360; 1975, $360/$365; 1976, $385; 1977, $405; 1978, $425/$445; 1979, $490; 1980, $550; 1981, $625; 1982, $590/$625; 1983, $590/625; 1984, $590/$665; 1985, $500/$590; 1986, $570/$625; 1987, $625/$660; 1988 (June), $665/$700.

SUPPLY/DEMAND *(000 tons)*



FORECAST *(000 tons)*

	1986	1987	1988e
Production	4,271	4,405	4,489
Capacity	4,576	4,675	4,768
Utilization rate	93.3%	94.2%	94.2%
Imports	5	7	8
Exports	569	564	610
Apparent U.S. consumption	3,707	3,848	3,887
lb/capita	30.80	31.70	31.70
GNP ratio[1]	1.00	1.01	1.00

e = Estimate.

[1] 1,000 tons/$billion real GNP.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity	Market share (%)
1. International Paper	848	17.8
2. Federal Paper[1]	631	13.2
3. Westvaco	600	12.6
4. Potlatch	537	11.3
5. Temple-Eastex	357	7.5
6. Champion	247	5.2
7. James River	235	4.9
8. Weyerhaeuser	210	4.4
9. Gulf States	200	4.2
10. Gilman Paper	185	3.9

Market share of top five companies:
62.4%

Market share of top ten companies:
85.0%

Total U.S. capacity (1988):
4.768 million short tons

[1] Capacity figure published in 1987 Grade Profile included bleached bristols tonnage.

FREE-SHEET

Boise to build uncoated free-sheet machine

Boise Cascade Corp. last month said it will add a new uncoated free-sheet machine and rebuild its pulp mill at International Falls, Minn., for about $525 million. The over 300,000-tpy paper machine is expected to be online in late 1990. The new machine will produce "the full range of uncoated white papers," according to a company spokesman. This includes envelope paper, tablet, cut-size and reprographic, offset, and forms bond. The new machine will run at about 3,500 fpm and have a 345-in. trim. No supplier has been chosen.

Current printing/writing paper capacity at International Falls is 210,000 tpy on three medium-size machines. Boise also will modernize and almost double the capacity of the existing 456-tpd pulp mill to about 900 tpd (or 320,000 tpy). Additional pulp to support the expanded paper capacity will come from the company's nearby Fort Frances, Ont., pulp and paper mill. The company will build a state-of-the-art bleach plant based on high chlorine dioxide substitution, according to Andrew Drysdale, manager of public affairs.

In addition, the company also will expand the woodyard and wood handling areas, stock preparation, warehouse, and paper handling areas, he said. Site preparation is expected to begin immediately and construction should commence in early fall.

Analysts expected announcement of a new world-class machine. "It's not surprising," said John Maine, vice president-printing and writing papers at Resource Information Systems Inc. Maine said that demand for uncoated free-sheet paper has been rising and will continue to grow above capacity, although a recession in late 1989-90 may cause operating rates and prices to fall. But growth will hit around 5%/year after the economy turns upward again in 1991-92.

"Our feeling is that we need to do this in order to continue growing with our customers," Drysdale said. U.S. demand for white papers, almost 11 million tons in 1987, is growing rapidly—about 40% in the last eight years and possibly another 35% in the next eight years, he said. "And we felt that at this point we needed to expand our capacity to keep pace with that demand and allow us to continue to supply both the commodity and value-added needs of our customers," Drysdale said.

This project is somewhat larger and more expensive than Boise officials had indicated they would be interested in pursuing, but Drysdale said the company expects a good rate of return.

"The scale of these machines has gotten so big that you're not competitive in the commodity sectors of the free-sheet market unless you're operating a 240,000- to 250,000-ton unit," said Bruce Kirk of Goldman Sachs' Investment Research Group. The new Boise machine would appear to be slightly larger than the 290,000-tpy unit being installed by Georgia-Pacific Corp. at Port Hudson, La., for late-1988 startup—previously believed to be the largest ever installed in North America. ■

New U.S. and Canadian uncoated free-sheet capacity through 1992.

U.S.	Location	Capacity (000 short tpy)	Startup date
Georgia-Pacific Corp.	Port Hudson, La	230	1986
Hammermill Paper Co.	Selma, Ala.	185	1986
Boise Cascade Corp.	Wallula, Wash.	40	1987
Champion International	Pensacola, Fla.	260	1987
Georgia-Pacific Corp.	Port Hudson, La.	290	1988
International Paper Co.	various (net)	200	1988–90
Willamette Industries Inc.	Bennetsville, S.C.	200	1990
Champion International[1]	Quinnesec, Mich. (net)	58	1990–91
Great Northern Nekoosa Co.	Ashdown, Ark.	80	1990
Boise Cascade Corp.	International Falls, Minn.	300	1990
Union Camp Corp.[2]	Eastover, S.C.	240	1992
Weyerhaeuser Co.[2]	Columbus, Miss.	20	n.a.
Bowater Inc.	Calhoun, Tenn.	under study	n.a.
Canada		**(metric tons)**	
Domtar Inc.[3]	Windsor, Que.	160	1987
Weyerhaeuser Co.	Prince Albert, Sask.	217	1988
Domtar Inc.	Windsor, Que.	160	1989
Great Lakes Forest Products	Dryden, Ont.	175	1989

North American capacities, 1988
U.S.: 11.780 million short tpy
Canada: 915 metric tpy (estimated)

n.a. = Not available or not applicable.

[1] Initially will produce uncoated free-sheet but designed for coated.

[2] Machine announced or discussed in principle but plans not finalized.

[3] During 1986–89 period, Domtar will also be shutting down 97 tpy of older capacity.

Willamette breaks ground for free-sheet machine

On June 24, Willamette Industries Inc. broke ground for its new greenfield mill near Bennettsville, S.C. The 710-tpd Valmet machine will manufacture alkaline-based uncoated free-sheet paper, a spokeswoman said. Startup is scheduled for September 1990.

The company already has received necessary water permits for the pulp and paper mill but is still awaiting air quality permits, according to the spokeswoman. Willamette is doing its own general contracting and engineering, which will help keep down expenses, although the company will not release cost projections.

(Several analysts have estimated the cost at around $325 million—which is approximately one-third less than the $485-million cost of another slightly smaller 600-tpd green-

Jefferson Smurfit considers restarting idle machine

Jefferson Smurfit Corp. may restart an idle machine to produce about 600 tpd of recycled medium and linerboard at Container Corp. of America's Fernandina Beach, Fla., mill.

"We're actively considering it, but no final decision has been made," according to Richard D. Quina, vice president and general manager-Containerboard Mill Div. He said that the project would involve the complete renovation of the idle linerboard machine, which was shut down in 1985, and the expansion of secondary fiber facilities.

The mill is completing a $30-million program to revamp woodyard equipment and retrofit new drives on two paper machines. This represents the final phase of a $250-million, five-year modernization project designed to increase production to 2,400 tpd by mid-1988.

Fernandina Beach last year managed to reduce unit energy costs 34%, while increasing average linerboard output from 1,764 tpd in 1986 to 2,137 tpd in 1987, according to the company's annual report, which says it is now one of the lowest-cost linerboard mills in the industry. ■

Clinch River restarts Harriman medium mill

Clinch River Corp. restarted the former Harriman Paperboard mill June 18, following a major reconstruction and modernization. The semichemical medium mill has been idle since November 1985 and was purchased by Clinch River in September 1987 for $2.15 million.

Clinch River was required to correct long-standing water quality problems at the Harriman, Tenn., mill before it was reopened. Consolidated Packaging Corp. had withdrawn its offer for the mill last year because compliance with effluent discharge limits was thought to be too costly. Clinch River has installed a new proprietary closed-loop, nondischarging treatment system developed with the assistance of Electric Controls & Service Co. Inc. (EC&S) of Birmingham, Ala., in order to comply with water quality standards.

EC&S was also contracted to manage the rebuild of the paper mill, which included the power plant, evaporators, digesters, and installation of Valmet's Damatic and Sentry System for process automation and quality control. The upgrade of the paper machine included increasing the speed of the drives from 1,500 fpm to 1,800 fpm, the addition of six new 5-ft-dia dryers, and expansion of the dry-end broke pit to better accommodate shipping.

The mill will produce 300-tpd of 0.009 corrugating medium, using approximately 75% hardwood furnish and 25% old corrugated and kraft clippings. Marketing of the mill's product, called "Clinchcor," will be done by the Gibson Group Inc., a Cincinnati, Ohio-based paperboard brokerage firm and one of the investors in Clinch River. ■

Nolichucky to restart Hyde Park mill

Nolichucky Industries Corp. (NIC), which is based in Greenville, Tenn., has signed a lease arrangement with James River Corp. to operate the company's Hyde Park, Mass., mill, which has been shut down since December.

Under the proposed arrangement, NIC will lease the mill property and equipment to produce recycled corrugating medium and will have an option to purchase the mill at a future date. James River announced its intention to sell the Hyde Park mill in July 1987, saying it no longer fit its long-term strategic plans.

"We are very pleased with this agreement because we have placed a high priority on returning the mill to productivity in a way that would make a long-term contribution to the community," noted Phillip Henss, James River's vice president-corporate planning. The mill was producing about 55,000 tpy of printing/writing papers from purchased pulp at the time it was shut down. ■

CAPITAL SPENDING

No cutback planned from record spending plans

U.S. paper industry capital expenditures are heading through the roof this year, according to two new surveys of spending plans. According to the Commerce Dept.'s Bureau of Economic Analysis, U.S. pulp and paper companies plan to spend a record $11.29 billion in 1988 on capital projects, a 26.6% increase over last year.

The new survey, conducted from January through March, shows virtually no change from a survey of 1988 spending plans, conducted at the end of 1987. The new forecast for 1988 of

Capital spending plans of major North American pulp and paper companies.

U.S. companies	**1988 (millions of $)**	**1987 (millions of $)**
Boise Cascade Corp.	$400	$259
Champion International	550	365
Consolidated Paper Corp.	101	69
Georgia-Pacific Corp.	900	825
International Paper Co.	700-750	603
James River Corp.	600	504
Kimberly-Clark Corp.	400-500	247
Mead Corp.	400-435	175
Potlatch Corp.	175	155
Temple-Inland	200+	138
Union Camp Corp.	325	182
Westvaco Corp.	350-400	280
Weyerhaeuser Co.	750	605
Canadian companies		
Canfor Corp.	C$120+	C$54
MacMillan Bloedel Ltd.	350-400	257
Noranda Forest Inc.	550	326

Source: Recent company statements and annual reports.

Chemical pulp bleaching never stronger

CONSUMPTION. With all the strong white paper segments of the market, it is no wonder that suppliers of chemicals to bleach chemical pulp have delivered record amounts over the past 18 months. In first-quarter 1988, GNP grew 3.9%, a pleasant surprise that also brought similar growth to bleached pulp end products. The chemical industry has had to play catch-up, successfully implementing price increases while balancing domestic and foreign marketing goals and corporate objectives. The future looks bright for mills and suppliers.

The trend of chlorine reduction continues, as the environmental winds remain strong. Although dioxin research has proved that pulp and paper industrials do not significantly contribute to the "toxification" of the environment, current and future regulatory statutes appear to be major driving forces in the flight to chlorine-reduction technology. The technologies themselves (dynamic mixers and pumps, oxygen, computer control, etc.) have performed admirably, and their use in the industry has gained considerably. Short-sequence bleaching by splitting, rebuilding, or constructing has given new meaning to three-stage bleaching. CDEOD seems to be making bright enough softwood pulp for captive use in uncoated free-sheet, bleached board, and tissue, while achieving salable market pulp properties for hardwood. Chlorine is still a useful and economical chemical in bleaching pulp, and its consumption has been on the rise since the paper production boom began in 1984. Producer restructuring resulted in a net supply loss of 15% during the last six years, and now that operating rates have reached 90% to 95%, the crunch is on. Coproduct caustic soda is in a more desperate situation, as demand across all industries soars and growth rates move higher than chlorine. Nearly 10% of the bleaching lines in North America now use high substitution of chlorine dioxide in chlorination stages, and the switch to short sequences helps that trend. This method is also being used because of water shortages, tough environmental laws, and viscosity concerns.

Dow Chemical has announced a new service called ChemAware. The basic program is free to all Dow customers and includes safety and handling videotapes, materials safety data sheets and literature, employee training sessions, and more.

Oxygen use in caustic extraction is reaching the saturation point. The greenfield projects and some split-line initiatives are including oxygen delignification processes into modernization plans. The lack of capital and operating experience are obstacles in faster implementation, with vast reduction in chemical and environmental costs the chief benefits.

PRICE. Because of the tight supply, prices have moved steadily upward since 1984. The sodium chlorate balance seems to be the most critical, with producers expanding but not as aggressively as future consumption needs indicate. QueNord, Alby-Olin, Canadian Oxy, and Albright & Wilson (formerly ERCO) have completed or are in the process of completing capacity expansions. QueNord will boost capacity at its Magog, Que., facility, and Kemanord has temporarily restarted graphite capacity at Columbus, Miss. Alby-Olin plans expansion for its plants in MacIntosh, Ala. and Valleyfield, Que. Canadian Oxy acquired BCM after expanding at Brandon, Man. Albright & Wilson modernized its facilities at Vancouver, B.C. Western Canadian bulk costs C$552/metric ton and solution is C$535/metric ton; eastern Canadian bulk and solution run C$50 to C$70 less. Southern U.S. deliveries list for US$385/ton for bulk crystal. Shipments with salt are generally higher. Prices are not as high as 1980 levels, but $400/ton is achievable soon.

Some chlorate producers maintain systems designers, and their workloads have increased significantly as capacity is challenged. After technology changes within the industry, manufacturers must choose product characteristics (crystal or solution, chrome content, salt, methanol, etc.) that will be profitable in the long term. Buyers interested in onsite chlorate generators must be aware of the unprofitable nature of the unit's production fluctuations. These concerns make it important to keep abreast of sodium chlorate supplier moves.

Chloralkali products have undergone changes, but they seem to have a bit more flexibility in influencing the balance. List prices for 50% caustic were bumped to US$225/ton in the East, US$200/ton in the South, and $255/ton in the West. Chlorine prices run about 25% lower. Caustic prices are strong for spot and contracts, but producers can really make money on the $400/ton export list price. Chloralkali capacity is available, but producers are watching economic and industry developments before selling it. The chemical producers are profitable in the late 1980s for the first time in a while, and they want to enjoy it.

As long as pulp and paper prices remain high, so too will chemical prices. This may help fuel inflation later, but for now it is welcome.

—Michael Ducey

Chemicals used in pulp bleaching enjoy growth in 1988.

Chemical	Pulp and paper consumption (lb)	% change 1987/1988	% change 1988/1989
Chlorine	22 billion	4.5%	4%
Caustic	21.8 billion	5.9%	6%
Chlorate	1.4 billion	5.5%	8%
Oxygen	250 million	7.5%	10%

PULP & PAPER

August 1988

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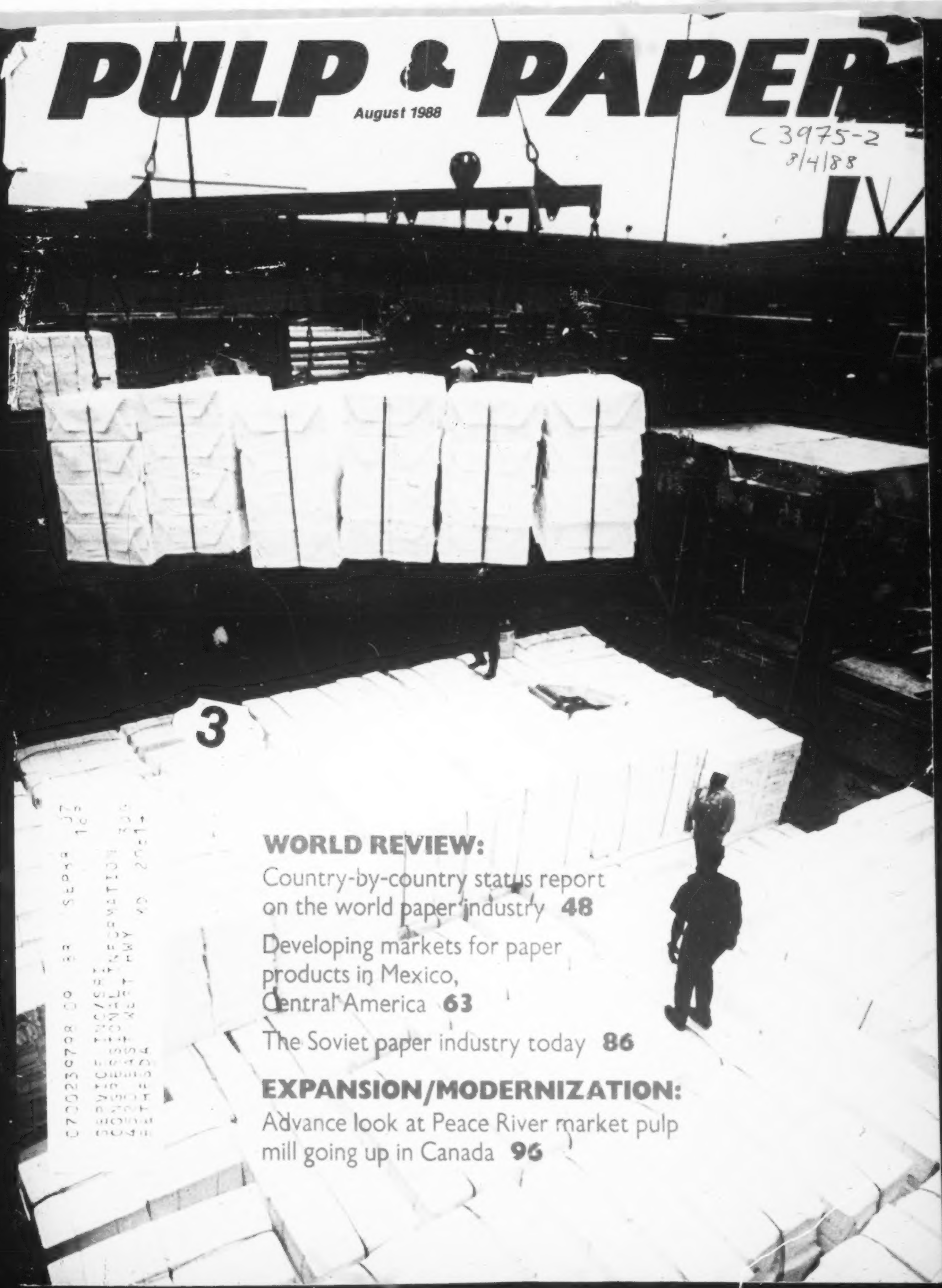

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This issue includes a status report on paper industry capacity, production, and expansion plans worldwide (see p. 48). **(Photo of U.S. pulp being loaded for export to Europe, courtesy of Port News, Charleston, S.C., a publication of S.C. State Ports Authority, Marion Bull, photographer and assistant editor.)**

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News*, *Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.
POSTMASTER: Please send addresses changes to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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Subscriptions & Address Change: Sent without charge in the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of $60.00 a year in the U.S. All subscriptions to other countries: $80.00 a year, except Europe and Mediterranean, $90.00 (air service included). Single copy, $6.00, except Buyers Guide, $30.00. Photocopies of articles and complete microform volumes available through University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106.

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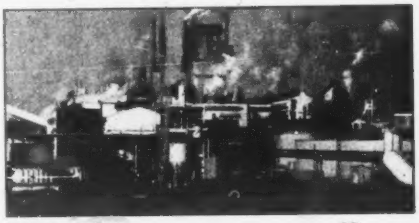

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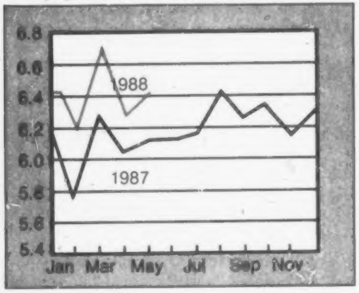
MONTH IN STATISTICS

U.S. paper and board production



Paper and paperboard production totaled 6.4 million tons in May, an increase of 5.0% over the same month in 1987, according to the American Paper Institute. On a seasonally adjusted basis, production was at a record pace of 76.8 million tpy through the first five months, up 4.7% from the same time last year. Exports were running almost 18% higher through April than for the same period last year, thanks mostly to big gains in the printing and writing grades. Imports grew at a 3.8% annual pace, with a slight decline in newsprint balancing big increases for printing and writing papers and tissue.

Among major grades, printing and writing papers continued to be very strong, rising 8.6% overall. New orders were up in the 6% to 10% range, while unfilled orders ranged 30% to 82% higher than last year. Fiber box shipments set a record for May, helping to lift containerboard production for domestic use up 5.2% compared with last year.

Canadian newsprint shipments totaled 856,000 metric tons in May, up 5.0% from May 1987. Newsprint mills operated at 100%, as they have all year. Woodpulp shipments totaled 683,000 tons, up 13.8%, while mills operated at 91%. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
***PAPER & PAPERBOARD PRODUCTION*[1]**					
Newsprint	May	514	2.8	5,996	5.5
Uncoated groundwood (s)	May	135	11.6	1,578	3.4
Coated paper (s)	May	600	8.3	7,422	12.6
Uncoated free sheet (s)	May	921	3.1	11,401	7.3
Other printing/writing	May	125	5.9	1,535	10.7
Total packaging and other paper (s)	May	422	6.6	5,256	2.0
Tissue	May	463	4.5	5,432	4.0
Total paper	**May**	**3,179**	**5.2**	**38,619**	**6.5**
Unbleached kraft paperboard	May	1,649	1.4	19,405	5.8
Semichemical medium	May	491	6.0	5,694	1.7
Bleached paperboard	May	360	-4.0	4,457	-0.3
Recycled paperboard	May	761	17.6	8,996	6.4
Total paperboard	**May**	**3,260**	**4.8**	**38,552**	**4.5**
Total U.S. paper and paperboard output	**May**	**6,439**	**5.0**	**77,171**	**5.5**
***PULP, WASTEPAPER & FIBER*[2]**					
Total U.S. woodpulp production	April	5,003	2.5	61,276	4.5
Market pulp production	April	677	1.0	8,449	7.6
Wastepaper consumption at paper/board mills	April	1,540	7.2	18,852	5.4
Pulpwood consumption (cords)	April	8,137	3.6	97,056	3.3
***CONVERTED PRODUCTS STATISTICS*[3]**					
Corrugated box shipments (billion ft^2)	May	24.986	5.6	127.859[6]	5.1
Containerboard inventories at U.S. box plants and mills	May 1	2,552	7.5		
***INTERNATIONAL TRADE*[2]**					
U.S. paper imports (including products)	April	1,063	2.4	12,846	3.4
Imports of Canadian newsprint	April	687	-2.4	8,568[6]	-0.9
U.S. paper exports (including products)	April	495	15.9	5,939	17.9
Exports of unbleached kraft linerboard	April	205	15.8	2,233	0.4
Exports of woodpulp	April	453	16.2	5,335	15.5
Norscan pulp inventories[4]	May 31	777	-17.0		
Norscan pulp operating rates[4]	May	90%	95%	102%	98%
CANADIAN STATISTICS*[5] *(reported in metric tons)					
Total newsprint shipments	May	856	5.0	4,023[6]	0.9
Operating rates	May	100%	97%	100%	98%
Inventories held by U.S. consumers	May 31	1,516	14.6		
Other paper/board shipments	May	584	10.2	2,802	6.1
Woodpulp shipments (export only)	May	683	13.8	3,315	3.1
Operating rates	May	91%	90%	96%	97%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Corrugating medium: Demand pushing supply limits—recycled board fills the gap

Grade structure: Corrugating medium, the middle fluting material used in corrugated containers, is made from both semichemical pulp and recycled fiber. In 1987, 77% of corrugating medium was made from semichemical furnish (which normally contains at least 20% recycled fiber) and 23% was "bogus" medium made from wastepaper. Basis weights of corrugating medium are 22, 26, 33, 36, and 40 lb/1,000 ft².

Standard sheet weight is 26 lb, which accounts for about 78% of production (although heavier weights have been growing in popularity). Recycled medium for equivalent uses is normally produced in slightly higher weights.

Production/capacity: U.S. production of corrugating medium rose about 5.8% from the previous year to 7.246 million tons in 1987. This reflected a 4.9% increase in corrugated box shipments.

The market for corrugating medium became tight during the second half of 1987 due to strong growth in corrugated box cut-up combined with only limited capacity expansion for semichemical medium. Semichemical medium capacity increased only 1.5% last year. As a result, recycled medium and imports have had to help fill the supply gap.

Semichemical medium production rose 4.7% in 1987, while recycled medium jumped 7.4%. Imports of medium (mainly from Canada) last year jumped nearly 30% to 129,000 tons. U.S. semichemical medium mills ran at 99% of capacity, while recycled mills did almost as well at 98%. Contributing to the tight market was Willamette Inc.'s decision to convert a medium machine to linerboard last year at its Albany, Ore., mill.

Outlook: Corrugated box shipments are expected to rise about 3.4% in 1988, followed by a 1.5% increase in 1989 reflecting a high level of U.S. manufacturing activity due to the weak dollar. Total medium production in 1988 is expected to rise close to 3% to 7.46 million tons, with semichemical up 1.7% and recycled 6.7% higher. In 1989, total medium production is expected to rise by 1.7% to nearly 7.6 million tons, with semichemical and recycled medium showing about equal growth.

American Paper Institute's November 1987 capacity survey figures have been revised upward to reflect reactivation or conversion of machines, additional incremental expansion, and operating improvements. For semichemical medium, capacity has been increased by 100,000 tons in 1988 and 150,000 tons in 1989 from the 5.711 and 5.863 million tons originally estimated for those years. Recycled capacity has been increased by 75,000 and 150,000 tons from the 1.752 and 1.764 million tons planned for 1988 and 1989, respectively. As a result, total medium capacity is expected to rise at about a 4% average annual rate over the two-year period—up from the 1.9% rate estimated in the 1987 API survey.

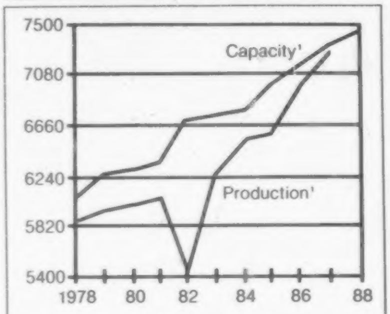
Clinch River Corp. recently restarted the 300-tpd semichemical medium mill at Harriman, Tenn., and Cascades Inc. has restarted two machines at the former Nitec Paper mill in Niagara, N.Y., making recycled medium. In addition, Nolichucky Industries Corp. plans to restart the former James River Corp. fine paper mill in Hyde Park, Mass., producing recycled medium. (In addition, Jefferson Smurfit Corp. is studying possible reactivation of an idle machine to produce recycled medium and linerboard at its Fernandina Beach, Fla., mill.)

Even on this larger capacity base, semichemical mills should run at about 98% this year and 96.6% in 1989, with recycled mills at 96% and 93%.

Prices. Semichemical medium prices last rose by $30/ton to a new list of $400 in March. Transaction prices are said to be close to the $390 to $400 level with some regional variation. The next increase in medium prices to about $430/ton will probably not take place until early 1989.

Price history at year-end for 26-lb semichemical medium in the eastern U.S. is as follows: 1980, $260; 1981, $290/$260; 1982, $240; 1983, $280; 1984, $310; 1985, $240; 1986, $290-$300 ($310 list); and 1987, $360 ($370 list). Recycled medium prices may be about $10/ton less, depending on quality.

SUPPLY/DEMAND *(000 tons)*



1. Represents both semichemical and recycled.

FORECAST *(000 tons)*

	1987	1988e	1989e
Production			
Semichemical	5,606	5,700	5,810
Recycled	1,640	1,760	1,780
Total	**7,246**	**7,460**	**7,590**
Capacity[1]			
Semichemical	5,641	5,811	6,013
Recycled	1,666	1,827	1,914
Utilization rates[1]			
Semichemical	99.4%	98.1%	96.6%
Recycled	98.4%	96.3%	93.0%
Imports[2]	129	140	145
Exports	64	55	65
Apparent U.S. consumption			
000 tons	7311	7545	7670
lb/capita	60.20	61.50	62.0
GNP ratio[3]	1.91	1.92	1.91

e = Estimate.

1. American Paper Institute November 1987 capacity survey figures have been revised upward. 2. Dept. of Commerce data. 3. 1,000 tons/$billion real GNP.

TOP U.S. PRODUCERS *(000 tpy)*

	Annual capacity			
Company	**Semi-chem**	**Recycled medium**	**Total**	**Market share (%)**
1. GNN	935[1]	—	935	12.5
2. Stone	675	180	855	11.5
3. Weyco	685	—	685	9.2
4. Inland	205	275	480	6.4
5. Smurfit	58[2]	305[2]	363	4.9
6. IP	350	—	350	4.7
7. Mead	335	—	335	4.5
8. G-P	280[3]	—	280	3.7
9. PCA	270	—	270	3.6
10. Va. Fibre	265	—	265	3.6

Market share of top five companies: **44.5%**
Market share of top ten companies: **64.6%**
Total U.S. capacity (1988):
7.463 million short tons

1. Includes Great Southern Paper and Nekoosa Packaging (717,000 tpy semichemical medium) acquired from Owens-Illinois Inc. in 1987. 2. Includes 50% interest in Container Corp. of America mills (115,000 semichemical and 172,000 recycled medium) acquired in 1986. 3. Includes 50% interest in 170,000-tpy semichemical medium machine at Sonoco Products Co.'s Hartsville, S.C., mill; G-P takes the production.

PAPER PRODUCTION GROWTH CONTINUES FOR THE FIFTH RECORD YEAR IN A ROW

Asia, North America, and Europe set output records; paper and board demand remains strong, and outlook for 1988 is good

By **PETER SUTTON, JOHN PEARSON, HUGH O'BRIAN,** International Editors

The world made 215,611,000 tons of paper and paperboard in 1987, 6% more than in 1986. It was the fifth record year in a row for output. Pulp production totaled 156 million tons, up nearly 5%, also continuing a five-year climb. And 1988 is likely to keep the trend going upward. Is no end in sight?

Production has kept in step with the rise in apparent paper and board consumption. It too has increased every year since the bad year of 1982. In 1987, it was 214 million tons, up nearly 6%. However, the world's population rose again, such that the world's per capita consumption stayed at 42 kg (92 lb).

The amount traded remained about the same compared with 1986: slightly more than one ton of paper in every five crosses a frontier. For pulp, it's less—about 16% of output is traded. The world's export and import figures almost balanced, a gap of 1.2 million tons for paper and board and of just 35,000 tons for pulp.

It was a good year for many papermaking nations, and of course records were set for most of the big producers. The unfortunate exceptions were several countries in southeast Asia and Africa.

North America had a bumper year. In many pulp, paper, and board sectors, mills had difficulty meeting demand and, naturally enough, U.S. domestic buyers took precedence over export trade. The U.S. continues to dominate the league table of paper producers, making 31% of the world's entire output. The Canadians, taking advantage of the decline in the U.S. dollar's value against other major currencies, boosted their exports 6%.

Many European countries also made more than ever before during a year in which the jump in demand, particularly for printings/writing grades, came as a surprise to many. Ten of the 19 western European nations enjoyed record paper and board production levels. The three export-oriented Nordic nations produced a million tons more paper and board than in 1986, crossing

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All figures in this review are in metric tons.

World's top 20 producing and consuming countries

PAPER AND BOARD PRODUCTION
(000 metric tons)

	1986	% change 1986/85
1. U.S.	67,544	+5.0
2. Japan	22,537	+7.0
3. Canada	16,046	+5.1
4. People's Rep. China	11,411	+14.3
5. U.S.S.R.	11,036	+6.2
6. Fed. Rep. Germany	9,924	+5.5
7. Finland	8,012	+6.1
8. Sweden	7,811	+6.1
9. France	5,832	+4.3
10. Italy	4,987	+6.9
11. Brazil	4,678	+3.4
12. U.K.	4,183	+6.1
13. Spain	3,288	+4.3
14. Rep. Korea	3,163	+14.1
15. Taiwan	2,737	+8.3
16. Mexico	2,575	+4.3
17. Austria	2,357	+8.3
18. Netherlands	2,168	+6.9
19. India	1,886	+4.8
20. Australia	1,678	+2.2

PULP PRODUCTION
(000 metric tons)

	1986	% change 1986/85
1. U.S.	54,036	+4.5
2. Canada	23,021	+6.1
3. U.S.S.R.	11,610	+5.9
4. Sweden	9,973	+6.2
5. Japan	9,733	+5.3
6. Finland	8,467	+6.8
7. People's Rep. China	7,204	+9.4
8. Brazil	4,031	+0.9
9. Fed. Rep. Germany	2,259	+1.8
10. France	2,092	+3.5
11. Norway	1,889	−0.4
12. South Africa	1,840	−1.9
13. Spain	1,598	+6.3
14. Portugal	1,462	+4.1
15. Austria	1,333	−0.8
16. New Zealand	1,108	−0.2
17. Czechoslovakia	1,090	+0.4
18. India	1,050	+0.0
19. Australia	964	+10.8
20. Poland	964	+10.8

PER CAPITA CONSUMPTION
(lb/year)

	1986	% change 1986/85
1. U.S.	640	+0.4
2. Sweden	524	+3.9
3. Netherlands	488	+24.9
4. Canada	469	+1.2
5. Finland	444	−0.3
6. Switzerland	416	−0.7
7. Fed. Rep. Germany	407	−0.1
8. Denmark	403	−0.2
9. Japan	381	−0.2
10. Belgium	374	+0.0
11. New Zealand	352	+1.4
12. Hong Kong	326	−3.3
13. Australia	315	−1.5
14. U.K.	312	−0.1
15. Norway	312	−0.5
16. Taiwan	284	−1.3
17. Austria	279	−0.1
18. France	275	−0.7
19. Iceland	244	−0.1
20. Italy	207	+0.3

the 17-million-ton mark. Pulp output increased by approximately the same amount and topped 20 million tons for the first time. East European countries had more modest increases, with the exception of the Soviet Union, where preliminary output figures show an increase of 6%.

Earthquakes aside, New Zealand and Australia are both showing much more activity. Though paper and board output was close to the previous year, companies in these two countries are busy merging and acquiring and investing in new capacity.

Japan's paper and board output continued its inexorable climb even while the industry carried out some extensive restructuring. One major difference in 1987 was that this was the largest annual increase in paper and board output (+7.2%) in its current record run since 1983.

China continued its steeply rising increase in paper and board output, up 14% to 11.4 million tons, and more is expected as some modernization programs and plans to improve the fiber supply come to fruition.

Other rapidly growing Asian producers did not meet their goals, but Rep. Korea still managed to raise production by 14%, crossing 3 million tons, and Taiwan had to be satisfied with an 8% rise. These four plus Turkey, which is perking up, account for 90% of Asia's output, but newcomers are beginning to grow now, Indonesia and Thailand in particular. India carries on, steadily raising output, and it has scored some noticeable successes in producing newsprint. However, old problems remain, such as expensive energy and a lack of available raw materials.

Several of the key Latin American nations did better than expected in still-difficult economic conditions. The future for the pulp and paper industries of Brazil, Chile, Argentina (which joined the million-tonners' class for the first time), and Venezuela is looking brighter than it has for several years. International investors are now being attracted by the fast-growing forests and low-cost bases that these countries have to offer. By 1992, several large pulp projects will be coming onstream in Brazil and Chile.

Africa remains a sorry tale, with output almost stagnant, and measurement has been made much more difficult following South Africa's decision not to publicize its production figures. It seems that the present process of economic restructuring in several key countries will have to be completed before output picks up. ■

AFRICA

Production of pulp and paper by the African countries was an estimated 2.4 million tons in 1987, the same level as the previous year. Pulp output also was approximately 2.4 million tons, practically unchanged from 1986.

Any appraisal of the continent's pulp and paper industry is dominated by the performance of South Africa, which accounts for roughly two-thirds of the continent's output of paper and board and about three-quarters of its pulp production. Unfortunately, South Africa's output and trade statistics are no longer published, but it is possible to make reasonable estimates based on a variety of freely available publications.

These show that 1987 was a relatively good year for the two major producers, Sappi and Mondi. Foreign trade in commodity pulp and paper grades was aided by a rise in international prices and by the twin fall of the U.S. dollar and the rand against other major currencies. On the domestic market, price hikes were possible for printing/writing and packaging papers, although buyers presented some stiff opposition.

1987 also brought its share of problems for South Africa's producers. A severe flood affected Mondi's Merebank newsprint mill, writing off thousands of tons of paper stocks and closing the mill for nearly a month. Sappi escaped the worst of the flooding but was hit by a chemical explosion that closed No. 2 pulp line at its Ngodwana market pulp and kraftliner mill (sabotage was ruled out by experts). Full production was resumed within two months. But neither incident seriously affected the companies' trading performances.

Elsewhere in Africa, fortunes were varied. The high foreign debt of several nations, which must be serviced in hard currency, has led to a shortage of dollars to pay for market pulp and machine spare parts. In some cases, concurrent economic reform, involving price controls or the removal of import tariffs, made things worse for the domestic producers. The picture was brighter for the continent's market pulp producers. Both Morocco, with a capacity of 100,000 tpy of eucalyptus pulp, and Swaziland, which makes 180,000 tpy of unbleached softwood grades, found their products in demand and were able to run at 100% capacity.

Few plans exist for capital expansion. In the case of South Africa, the full benefits of a wave of expansions completed at the start of the current economic boom are now being realized. Among the others, investment levels will remain small. One possible exception is Zimbabwe, where plans are slowly taking shape for a 60,000-tpy bleached kraft pulp mill and fine paper machine, as well as the possible expansion of mechanical pulping and newsprint capacity. 1988 is thus expected to be another static year. Apart from the inexorable growth in South Africa's trading performance, the other nations are likely to remain in the doldrums. ■

REVIEW OF TOP 20 NATIONS IN PULP/PAPER PRODUCTION

Australia

Population: 16,249,000. Per capita consumption of paper and board: 146 kg/321 lb. Paper and board mills: 18. Pulp mills: 19 (sulfate: 2; sulfite: 1; soda: 2; semichemical: 5; mechanical: 8; nonwood: 1).

Paper/board capacity: 2,035,000 tons **Pulp capacity:** 1,100,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1986	1987	1986	1987	1986	1987
Paper	1,177	1,234	775	800	92	98
Board	465	444	—	—	—	7
Total	**1,642**	**1,678**	**775**	**800**	**92**	**105**
Chemical woodpulp	503	585	220	279	20	70
Mechanicals, other pulps	367	379	3	1	—	—
Total	**870**	**964**	**223**	**280**	**20**	**70**
Market pulp	—	—	—	—	—	—

Austria

Population: 7,571,700. Per capita consumption of paper and board: 132 kg/290 lb. Paper and board mills: 33. Pulp mills: 15 (sulfate: 3; sulfite: 7; semichemical: 1; mechanical: 5).

Paper/board capacity: 2,709,000 tons **Pulp capacity:** 1,603,000
Operating rate 1987: 87% **Operating rate 1987:** 83%

(000 metric tons)

	Production		Imports		Exports	
	1986	1987	1986	1987	1986	1987
Paper	1,832	1,989	318	338	1,303	1,449
Board	351	368	23	24	262	269
Total	**2,183**	**2,357**	**341**	**362**	**1,565**	**1,718**
Chemical woodpulp	1035	1,014	291	339	330	281
Mechanicals, other pulps	309	319	25	13	—	1
Total	**1,344**	**1,333**	**316**	**352**	**330**	**282**
Market pulp	408	363	316	352	330	282

Brazil

Population: 141,500,000. Per capita consumption of paper and board: 31 kg/68 lb. Paper and board mills: 146. Pulp mills: 38 (sulfate: 16; sulfite: 3; soda: 6; semichemical: 4; nonwood: 9).

Paper/board capacity: 5,364,000 tons **Pulp capacity:** 4,474,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1986	1987	1986	1987	1986	1987
Paper	4,026	4,150	279	265	649	593
Board	499	528	2	3	43	16
Total	**4,525**	**4,678**	**281**	**268**	**692**	**609**
Chemical woodpulp	3,517	3,568	36	44	879	807
Mechanicals, other pulps	480	463	4	1	17	9
Total	**3,997**	**4,031**	**40**	**45**	**896**	**816**
Market pulp	1,536	1,507	40	45	896	816

Canada

Population: 25,600,000. Per capita consumption of paper and board: 218 kg/480 lb. Paper and board mills: 77. Pulp mills: 34.

Paper/board capacity: 16,520 tons **Pulp capacity:** 24,740 tons

(000 metric tons)

	Production		Imports		Exports	
	1986	1987	1986	1987	1986	1987
Paper	14,535	15,304	421	471	10,413	11,072
Board	726	742	219	229	66	80
Total	**15,261**	**16,046**	**640**	**700**	**10,479**	**11,152**
Chemical woodpulp	12,218	12,957	172	160	7,083	7,467
Mechanicals, other pulps	9,470	10,064	47	38	776	785
Total	**21,688**	**23,021**	**219**	**198**	**7,859**	**8,252**
Market pulp	7,366	8,013	—	—	6,690	7,106

China, People's Rep. of

Population: 1,080,000,000. Per capita consumption of paper and board: 12 kg/25 lbe. Paper and board mills: 5,000e Pulp mills: 9,000

Paper/board capacity: 12,500,000e tons **Pulp capacity:** 9,000,000. tons

(000 metric tons)

	Production		Imports		Exports	
	1986	1987	1986	1987	1986	1987
Paper	2,742	3,022e	175	221	104	127
Packaging paper/board	4,594	5,444e	878	1,101	163	190
Other paper/board	2,650	2,945e	165	14	40	3
Total	**9,986**	**11,411e**	**1,218**	**1,336**	**307**	**320**
Chemical woodpulp	942	994	483	638	—	—
Mechanical pulp	402	384e	26	26	—	—
Reed, bamboo, other pulps	5,239	5,826	67	19	—	—
Total	**6,583**	**7,204e**	**576**	**683**	**7**	**5**
Market pulp	196	196e	576	683	7	5

Finland

Population: 4,932,000. Per capita consumption or paper and board: 196 kg/431 lb. Paper and board mills: 46. Pulp mills: 47 (sulfate: 18; sulfite: 3; semichemical: 3; mechanical: 23).

Paper/board capacity: 8,590,000 tons **Pulp capacity:** 9,085,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1986	1987	1986	1987	1986	1987
Paper	6,489	6,913	53	64	5,335	5,837
Board	1,060	1,090	20	21	828	900
Total	**7,549**	**8,003**	**73**	**85**	**6,163**	**6,737**
Chemical woodpulp	4,935	5,277	27	52	1,348	1,478
Mechanicals, other pulps	2,993	3,190	48	40	131	163
Total	**7,928**	**8,467**	**75**	**92**	**1,479**	**1,641**
Market pulp	1,819	2,027	75	92	1,479	1,641

France

Population: 55,800,000. Per capita consumption of paper and board: 130 kg/286 lb. Paper and board mills: 147. Pulp mills: 21 (sulfate 7; sulfite: 2; semichemical: 1; mechanical: 10; nonwood 1)

Paper/board capacity: 6,639,000 tons **Pulp capacity:** 2,240,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1986	1987	1986	1987	1986	1987
Paper	5,065	5,277	2,239	2,406	1,291	1,454
Board	529	555	560	633	146	155
Total	**5,594**	**5,832**	**2,799**	**3,039**	**1,437**	**1,609**
Chemical woodpulp	1,585	1,623	1,641	1,633	340	398
Mechanicals, other pulps	437	469	128	132	5	6
Total	**2,022**	**2,092**	**1,769**	**1,765**	**345**	**404**
Market pulp	712	718	1,769	1,765	345	404

Germany, Fed. Rep.

Population: 61,150,000. Per capita consumption of paper and board: 191 kg/420 lb. Paper and board mills: 175. Pulp mills: 35 (sulfite: 8; semichemical: 1; mechanical: 24).

Paper/board capacity: 10,931,000 tons **Pulp capacity:** 2,490,000
Operating rate 1987: 93% **Operating rate 1987:** 91%

(000 metric tons)

	Production		Imports		Exports	
	1986	1987	1986	1987	1986	1987
Paper	8,468	8,949	4,471	4,711	2,463	2,793
Board	939	975	430	423	559	591
Total	**9,407**	**9,924**	**4,901**	**5,134**	**3,022**	**3,384**
Chemical woodpulp	816	826	3,009	3,134	127	140
Mechanicals, other pulps	1,403	1,433	67	66	—	—
Total	**2,219**	**2,259**	**3,076**	**3,200**	**127**	**140**
Market pulp	248	282	3,076	3,200	127	140

ASIA/ AUSTRALASIA

Output of paper and board in Asia/Australasia grew to a record level of 45.1 million tons in 1987, up 9.8% from 1986. Output of pulp from this region was over 20 million tons for the first time, a rise of 6.4%.

It was a momentous year. Japan, Rep. Korea, Taiwan, and China recorded impressive increases in production. Meanwhile, New Zealand and Australia began a major phase of expansion and restructuring, and Indonesia and Thailand began to exploit their natural forest resources.

Japan is by far the region's major producer, making nearly 50% of the paper and board and 48% of the pulp. In 1987, Japan's domestic economy grew faster than expected, with GNP up by 4.2% in real terms from 1986. Domestic demand for paper and board was even better, rising by 7.2%. Advertising for consumer goods fueled paper demand, and board demand was helped by an upswing in containerboard packaging.

Despite the surge in the value of the yen against the dollar, the level of imports was flat at around 866,000 tons. The reasons were tight world markets in many grades plus soft prices on the domestic market, which discouraged importers. Domestic pulp production was up 5.4%, to 9.73 million tons. Pulp imports increased sharply, however, by 8.5%.

Japanese companies have invested heavily to improve efficiency, with capital spending concentrated on newsprint and coated paper lines. Companies are also now increasing their investments overseas, with North America the main target for investment. In the past, investments have taken the form of joint ventures, but companies are now more likely to buy and manage their own subsidiaries or to build their own mills.

People's Rep. China overtook the U.S.S.R. to become the world's fourth-largest producer of paper and board in 1987. Its output passed the 11-million-ton mark for the first time, reaching 11.4 million tons, up from only 9.99 million tons in 1986. China's target for the next 15 to 25 years is to reach a per capita consumption of 40 kg (88 lb), up from the present 11.5 kg (25.3 lb) average. The current levels of investment spending imply that this is a realistic goal.

Rep. Korean producers produced 3.16 million tons of paper and board in 1987, an increase of 14.1% from 1986. However, the year was not problem-free. Steadily rising market pulp prices, plus political reform that led to strikes and eventually to high wage settlements, severely impaired company profitability. And the Korean currency, the won, rose steadily against the dollar, hurting the ability of producers to export their products. Also, a faster-than-expected relaxation in import duties exposed the industry to added competition on the domestic market and led to restructuring, especially in the board sector, as producers switched from waste-based linerboard to duplex and coated grades.

Growth in output in Taiwan was a lower-than-expected 8.5%, or 2.74 million tons. The reasons were the slowdown in export trade as the Taiwanese dollar rose against the U.S. dollar, higher imports as a result of lower tariff barriers, and a delay in the deregulation of newspapers, which hit demand for newsprint. Despite these setbacks, investment by the domestic industry is continuing apace and is expected to rise in 1988.

The major Australasian nations, Australia and New Zealand, embarked on a new phase of development in 1987, with restructuring and investment at home and abroad the key words. Australian output was a relatively flat 1.68 million tons, up 2.1%. However, the list of investments planned by the major companies is impressive. They include a 400,000-tpy bleached eucalyptus pulp mill to be built by APPM together with the Canadian Noranda group, a newsprint paper machine to be built by ANM at its Albury, Australia, mill, and another possible eucalyptus pulp mill to be built by APM Ltd. with international partners.

Expansion by acquisition was also important, with North American purchases particularly notable. Smorgon Consolidated Industries bought FSG Paper's newsprint mill in Chicago, Ill., while the Pratt Group bought the Georgia Kraft Co. linerboard mill. Rumors are that Amcor, the parent of APM, will be next to buy into North America.

In New Zealand, paper and board output fell 4% to 644,000 tons, mainly due to a major earthquake in March, which shut down all three of Tasman Pulp and Paper Co. Ltd.'s newsprint paper machines (total capacity 330,000 tpy) as well as its 170,000-tpy market pulp line. Despite this, pulp output was 1.11 million tons in 1987.

Restructuring and investment were the strong features of 1987, and New Zealand's biggest industrial company, Fletcher Challenge, was at the center of events. It bought 100% of the 70,000-tpy Bio-Bio newsprint mill in Chile and increased its majority shareholdings in Canada's Crown Forest Products and BCFP (recently, the group has decided to merge its Canadian operations). At home, Fletcher Challenge won control of Winstone Pulp Industries' 200,000-tpy CTMP mill but lost its battle for control of New Zealand Forest Products, the latter being sold after a long series of takeover attempts to Elders Resources of Australia. Recently, Fletcher Challenge bought up 50% of Australia's news-

India

Population: 700,000,000. Per capita consumption of paper and board: 2 kg/5 lb. Paper and board mills: 300. Pulp mills: 1.

Paper/board capacity: 2,760,000 tons **Pulp capacity:** —
Operating rate 1987: 68 % **Operating rate 1987:** — %

(000 metric tons)

	Production		**Imports**		**Exports**	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	1,100	1,136	194	189	—	—
Board	700	750	—	—	—	—
Total	**1,800**	**1,886**	**—**	**—**	**—**	**—**
Chemical woodpulp	—	—	—	—	—	—
Mechanicals, other pulps	—	—	—	—	—	—
Total	**—**	**—**	**—**	**—**	**—**	**—**
Market pulp	30	15	290	300	—	—

Italy

Population: 57,319,000. Per capita consumption of paper and board: 104 kg/229 lb. Paper and board mills: 340. Pulp mills: 21 (sulfite: 2; semichemical: 3; mechanical: 15; nonwood: 1) .

Paper/board capacity: 5,300,000 tons **Pulp capacity:** 850,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	3,778	4,033	1,635	1,920	890	949
Board	887	954	157	204	186	214
Total	**4,665**	**4,987**	**1,792**	**2,124**	**1,076**	**1,163**
Chemical woodpulp	205	218	1,712	1,938	50	36
Mechanicals, other pulps	506	519	110	147	3	8
Total	**711**	**737**	**1,822**	**2,085**	**53**	**44**
Market pulp	230	250	1,822	2,085	53	44

Japan

Population: 122,000,000. Per capita consumption of paper and board: 185 kg/407 lb. Paper and board mills: 489. Pulp mills: 61 (sulfate: 37; sulfite: 4; semichemical: 9; mechanical: 27; nonwood: 3) .

Paper/board capacity: 25,286,000 tons **Pulp capacity:** 12,571,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	18,238	19,535	815	818	638	608
Board	2,824	3,001	38	47	202	206
Total	**21,062**	**22,536**	**853**	**865**	**840**	**814**
Chemical woodpulp	7,176	7,606	1,868	2,029	37	15
Mechanicals, other pulps	2,036	2,126	694	700	2	1
Total	**9,212**	**9,732**	**2,562**	**2,729**	**39**	**16**
Market pulp	937	956	2,562	2,729	39	16

Korea, Rep. of

Population: 42,082,000. Per capita consumption of paper and board: 70 kg/153 lb. Paper and board mills: 150e. Pulp mills: 5 (sulfate: 1; mechanical: 4) .

Paper/board capacity: 3,421,000 tons **Pulp capacity:** 427,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	2,207	2,506	123	158	105	116
Board	567	656	5	6	176	282
Total	**2,774**	**3,162**	**128**	**164**	**281**	**398**
Chemical woodpulp	144	147	677	739	0	0
Mechanicals, other pulps	143	168	63	60	0	0
Total	**287**	**315**	**740**	**799**	**0**	**0**
Market pulp	144	147	740	799	0	0

Mexico

Population; 82,000,000. Per capita consumption of paper and board: 29 kg/64 lb. Paper and board mills: 64. Pulp mills: 15 (sulfate: 8; mechanical 2; nonwood: 5) .

Paper/board capacity: 3,337,000 tons **Pulp capacity:** 947,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	2,199	2,299	68	61	135	243
Board	271	276	3	5	—	—
Total	**2,470**	**2,575**	**71**	**66**	**135**	**243**
Chemical woodpulp	422	438	312	454	—	20
Bagasse/straw	228	227	—	—	—	—
Mechanical, other pulps	124	134	33	25	—	—
Total	**774**	**799**	**345**	**479**	**—**	**20**
Market pulp	265	—	—	—	—	—

Netherlands

Population: 11,661,000. Per capita consumption of paper and board: 181 kg/398 lb. Paper and board mills: 32. Pulp mills: 3 (mechanical: 2; nonwood: 1) .

Paper/board capacity: 2,333,000 tons **Pulp capacity:** 198,000
Operating rate 1987: 94 % **Operating rate 1987:** 68 %

(000 metric tons)

	Production		**Imports**		**Exports**	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	1,375	1,495	1,514	1,580	887	1,028
Board	654	673	320	338	387	411
Total	**2,029**	**2,168**	**1,834**	**1,918**	**1,274**	**1,439**
Chemical woodpulp	0	0	568	561	24	31
Mechanicals, other pulps	133	135	25	26	2	3
Total	**133**	**135**	**593**	**587**	**26**	**34**
Market pulp	—	—	—	—	—	—

Spain

Population: 39,310,648. Per capita consumption of paper and board: 90 kg/198 lb. Paper and board mils: 163. Pulp mills: 26 (sulfate: 24; sulfite: 1; mechanical: 5; nonwood: 6) .

Paper/board capacity: 3,600,000 tons **Pulp capacity:** 1,720,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	2,812	2,931	617	689	343	405
Board	340	357	40	54	93	103
Total	**3,152**	**3,288**	**657**	**743**	**436**	**508**
Chemical woodpulp	1,301	1,377	435	419	428	506
Mechanicals, other pulps	203	219	9	9	6	7
Total	**1,504**	**1,596**	**444**	**428**	**434**	**513**
Market pulp	706	803	444	428	434	513

Sweden

Population: 8,400,000. Per capita consumption of paper and board; 233 kg/513 lb. Paper and board mills: 55. Pulp mills: 55 (sulfate: 25; sulfite: 7; semichemical: 2; mechanical: 21) .

Paper/board capacity: 8,210,000 tons **Pulp capacity:** 10,490,000 tons

(000 metric tons)

	Production		**Imports**		**Exports**	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	6,152	6,582	192	203	4,707	5,084
Board	1,211	1,229	77	85	929	1,010
Total	**7,363**	**7,811**	**269**	**288**	**5,636**	**6,094**
Chemical woodpulp	6,669	7,001	154	139	2,352	2,416
Mechanicals, other pulps	2,726	2,972	4	5	589	619
Total	**9,395**	**9,973**	**158**	**144**	**2,941**	**3,035**
Market pulp	3,436	3,526	—	—	2,941	3,035

print manufacturer ANM and half of Pisa, the Brazilian newsprint producer.

Expansion can also be expected among New Zealand's other companies. Now that NZFP's future has been decided, a big investment program at its Kinleith mill will raise capacity by 130,000 tpy of paper and board. And Caxton Paper Mills Ltd. is also considering a new kraft pulp line for the early 1990s, as well as a new CTMP line.

1987 was a good year for two Asian countries—Indonesia and Thailand. In Indonesia, long-awaited capital spending projects are now under way, including a new integrated sack kraft and linerboard mill in northern Sumatra, a greenfield dissolving and paper-grade pulp mill (also in northern Sumatra), and a new coated paper line. Overall, the country's output has risen strongly, and exports are growing fast.

Perhaps the only bleak spots in Asia this year are the countries of the Indian subcontinent. Chronic problems of poor fiber supply, expensive power, and labor unrest will have to be overcome before the full potential of these countries can be met. Even so, Indian production of paper and board did improve to 1.89 million tons in 1987, up 5% from 1986. ■

LATIN AMERICA

Optimism is a key word of the Latin American pulp and paper industry in mid-1988. In Brazil, Chile, Argentina, Venezuela, and Colombia, the outlook for the pulp and paper industry has rarely been so bright in the past few years. Despite the profound economic difficulties facing these countries, total output and consumption of pulp and paper are rising strongly and imports are relatively static. Equally important to the future of the industry, major expansion projects that had long been gathering dust now seem set to become reality, some of them with help from foreign capital.

Having broken through the 10-million-ton barrier for the first time in 1986, paper and board output from the continent's producers grew by 5%—or just over a half-million tons—in 1987. Total consumption of paper and board was over 11 million tons, a rise of 5.1%. The growth in pulp output was a more modest 1.9% to 6.99 million tons.

Brazil is by far the major producer, accounting for 44.5% of all paper and board produced in Latin America as well as 57.7% of its pulp output. Last year was another chaotic one for the country's economy, with record inflation of 360%, rising taxes, GNP growth of only 2%, and some tough bargaining on rescheduling the $120-billion foreign debt. But positive signs for the future are the balance of payments surplus, which was a steady $1 million/ month in 1987, and plans to convert the huge debt into venture capital, freeing funds for industrial investment.

Official Brazilian government financing agencies are planning to spend $5.06 billion in the next four years on pulp capacity expansions. Besides those at Aracruz Celulose, Cenibra, and Riocell, new projects have come to the fore, including Proin, a joint venture between 11 nonintegrated mills to build their own pulp mill; Copener, an energy company that has large plantations of eucalyptus originally grown for fuel but, with falling oil prices, now considered more suitable for pulping; and a reactivation of the Guatapara project by Grupo Votorantin. Also, a joint venture between CVRD and Suzano will build a new 350,000-tpy eucalyptus pulp mill in Bahia do Sul. If these projects proceed (and it is likely that several will) the net addition to Brazil's pulp capacity will be over 3 million tpy by the end of 1992. New paper machine announcements can be expected.

Expansion is the key word in Chile as well, much of it funded with foreign capital. Three important new market pulp lines, two softwood and one hardwood, are scheduled for startup by the end of 1992. U.S. capital is involved in one of the softwood lines, a new $500-million, 315,000-tpy greenfield pulp mill near Nacimiento to be built by CMPC in cooperation with Simpson Paper Co. of California. Simpson will hold a 50% share in the project. Celulosa Arauco y Constitucion is also planning a new $450-million, 750-tpd pulp line at its Arauco mill. Both of these facilities will use Chilean radiata pine as raw material.

Although the first major investment is still being awaited, Argentina is beginning to attract investor attention. An emerging stable democracy and modest improvements seem to be spurring their interest. Domestic companies are embarking on expansion projects meanwhile. Two of them, Celulosa Puerto Piray's 210,000-tpy bleached softwood kraft mill and the Cuatiara project, will on completion raise the country's softwood pulp output by 50% and double its capacity of printing/writing papers.

Expansion fever is also apparent in Venezuela. All of the major domestic mills have plans to raise output, and foreign investment is again entering the country. This time Abitibi-Price Inc. of Canada, Bowater Inc. of the U.S., the Venezuelan government, and Venezuelan publishers have signed a letter of intent to build a 200,000-tpy newsprint machine for startup in 1991.

Moving to Central America, the picture is somewhat less bright. Many countries are still in a state of military and political uncertainty. However, for the region's largest producer, Mexico, a big improvement in

WORLD PULP, PAPER, AND BOARD INDUSTRY AT A GLANCE

Continent/ country	Population (1,000)	Number of mills		Capacity (1,000 tons)		Per capita (lb)	Apparent consumption (1,000 tons)				Production (1,000 tons)			
		P&B	Pulp	P&B	Pulp		P&B		Pulp		P&B		Pulp	
							1986	1987	1986	1987	1986	1987	1986	1987
EUROPE														
Belgium[1]	10,000	14	2	1,120	450	375	1,703	1,862	597	710	850	1,029	304	382
Denmark	5,200	11	3	350	145	404	954	1,022	146	135	333	323	95	81
France	55,000	147	21	6,639	2,240	274	6,956	7,262	3,446	3,453	5,594	5,832	2,022	2,092
Germany, Fed. Rep.	61,150	175	35	10,931	2,490	406	11,286	11,674	5,168	5,319	9,407	9,924	2,210	2,259
Greece	9,700	22	2	470	65	132	583	640	217	230	373	416	26	50
Ireland	3,595	2	0	50	0	176	288	320	11	15	15	30	0	0
Italy	57,319	340	21	5,300	850	207	5,381	5,948	2,480	2,775	4,665	4,987	711	734
Netherlands	11,661	32	3	2,333	198	488	2,589	2,647	700	688	2,029	2,168	133	135
Portugal	10,230	94	8	805	1,390	126	587	602	438	452	665	627	1,405	1,462
Spain	39,311	163	26	3,600	1,720	189	3,372	3,570	1,514	1,515	3,153	3,206	1,504	1,598
United Kingdom	56,650	93	6	4,361	490	313	8,068	8,734	2,081	2,325	3,941	4,183	399	389
EEC	**320,616**	**1,093**	**127**	**35,949**	**10,038**	**287**	**41,767**	**44,281**	**16,798**	**17,617**	**31,025**	**32,807**	**8,818**	**9,182**
Finland	4,932	46	47	8,590	9,065	444	995	904	6,524	6,918	7,549	8,012	7,928	8,467
Norway	4,180	19	24	1,850	2,125	312	593	569	1,393	1,382	1,573	1,590	1,896	1,889
Sweden	8,400	55	55	8,210	10,490	523	1,998	2,005	6,612	7,082	7,363	7,811	9,395	9,973
Nordic	**17,512**	**120**	**126**	**18,650**	**21,700**	**451**	**3,586**	**3,478**	**14,529**	**15,382**	**16,485**	**17,413**	**19,219**	**20,329**
Austria	7,572	33	15	2,709	1,603	279	959	1,001	1,330	1,408	2,183	2,357	1,344	1,333
Iceland	244	0	0	0	0	244	27	27	0	0	0	0	0	0
Malta	355	0	0	0	0	62	10	10	0	0	0	0	0	0
Switzerland	6,566	29	6	1,150	365	416	1,243	1,327	594	596	1,087	1,147	310	324
Other W. Europe	**14,737**	**62**	**21**	**3,859**	**1,968**	**334**	**2,239**	**2,365**	**1,924**	**2,004**	**3,270**	**3,504**	**1,654**	**1,657**
Total W. Europe	**352,865**	**1,275**	**274**	**58,458**	**33,706**	**297**	**47,592**	**50,124**	**33,251**	**35,003**	**50,780**	**53,724**	**29,691**	**31,168**
Albania	2,970	4	4	15	15	13	17	17	10	10	10	10	10	10
Bulgaria	9,000	15	9	520	260	108	440	440	270	270	350	350	220	220
Czechoslovakia	15,587	38	23	1,261	1,223	165	1,167	1,181	736	740	1,247	1,261	1,086	1,090
German, Dem. Rep.	16,640	21	19	1,500	750	183	1,381	1,356	811	835	1,327	1,339	674	672
Hungary	10,100	10	5	550	150	149	686	668	249	272	517	522	62	69
Poland	37,800	48	21	1,500	1,086	80	1,370	1,391	1,007	1,090	1,320	1,375	876	906
Romania	22,820	20	12	850	750	68	710	728	650	660	750	768	600	610
USSR	275,000	84	57	11,500	10,000	79	9,850	10,486	10,208	10,855	10,395	11,036	10,963	11,610
Yugoslavia	23,000	30	21	1,600	950	116	1,210	1,055	936	879	1,350	1,307	840	800
E. Europe	**412,917**	**270**	**171**	**19,296**	**15,184**	**90**	**16,831**	**17,322**	**14,877**	**15,611**	**17,266**	**17,968**	**15,331**	**15,967**
Total Europe	**765,782**	**1,545**	**445**	**77,754**	**48,890**	**185**	**64,423**	**67,446**	**48,128**	**50,614**	**68,046**	**71,682**	**45,022**	**47,155**
NORTH AMERICA														
Canada	25,600	77	34	16,520	24,740	469	5,461	5,594	14,048	14,967	15,261	16,046	21,688	23,021
United States	243,773	555	219	70,780	55,170	640	70,969	74,488	51,837	54,000	64,307	67,544	51,726	54,036
North America	**269,373**	**632**	**253**	**87,300**	**79,910**	**624**	**76,430**	**80,082**	**65,885**	**68,967**	**79,568**	**83,590**	**73,414**	**77,057**
ASIA														
Afghanistan	16,000	0	0	0	0	<1	2	2	0	0	0	0	0	0
Bangladesh	105,000	8	9	127	126	2	114	117	95	99	113	115	75	83
Bahrain	400	0	0	0	0	33	6	6	0	0	0	0	0	0
Bhutan	1,400	0	0	0	0	2	1	1	0	0	0	0	0	0
Brunei	200	0	0	0	0	33	3	3	0	0	0	0	0	0
Burma	37,850	3	2	31	30	3	44	47	25	27	24	27	27	29
China, Peo. Rep.[2]	1,080,000	50	50	12,500	9,000	22	10,897	12,427	7,152	7,882	9,986	11,411	6,583	7,204
Cyprus	650	1	0	10	0	108	32	37	1	1	2	2	0	0
Hong Kong	5,500	2	0	15	0	325	812	812	0	0	12	12	0	0
India	700,000	300	100	2,760	1,450	6	2,050	2,136	1,340	1,350	1,800	1,886	1,050	1,050
Indonesia	165,150	36	16	980	442	10	762	794	505	500	642	775	250	270
Iran	50,000	6	2	300	188	15	335	422	82	75	120	105	66	60
Iraq	15,500	2	2	144	90	10	70	65	47	33	30	25	30	14
Israel	4,500	5	0	170	0	198	404	471	66	68	159	174	0	0
Japan	122,000	489	61	25,286	12,571	380	21,078	22,589	11,765	12,448	21,062	22,537	9,240	9,733
Jordan	3,600	3	0	18	0	39	64	78	11	12	14	14	0	0
Kampuchea	6,200	0	0	0	0	<1	2	2	0	0	0	0	0	0
Korea, Peo. Rep.	20,000	6	2	100	80	9	80	80	70	70	80	80	60	60
Korea, Rep.	42,082	150	5	3,421	427	137	2,620	2,929	1,027	1,114	2,773	3,163	287	315
Kuwait	1,910	1	0	25	0	105	91	91	10	10	23	23	0	0
Laos	4,000	0	0	0	0	<1	1	1	0	0	0	0	0	0
Lebanon	2,700	3	0	50	0	61	75	75	5	5	15	15	0	0
Macao	300	0	0	0	0	29	4	4	0	0	0	0	0	0
Malaysia	15,790	13	1	220	92	60	429	455	17	32	70	70	10	10
Mongolia	1,950	1	1	10	6	23	20	20	5	5	5	5	5	5
Nepal	17,576	2	2	7	7	2	18	19	3	5	3	5	3	5
Oman	1,200	0	0	0	0	11	6	6	0	0	0	0	0	0
Pakistan	88,880	15	3	160	100	7	277	344	109	116	106	96	86	75
Philippines	56,000	23	3	515	208	15	372	445	120	123	254	308	121	146
Qatar	300	0	0	0	0	73	10	10	0	0	0	0	0	0
Saudi Arabia	9,000	0	0	0	0	24	100	100	0	0	0	0	0	0
Singapore	2,500	2	0	31	0	195	222	220	6	6	10	10	0	0
Sri Lanka	15,000	2	2	27	26	11	77	77	12	15	27	27	7	8
Syria	10,500	12	12	6	6	17	80	80	5	5	5	5	5	5
Taiwan	19,725	152	3	3,170	500	284	2,545	2,880	600	713	2,527	2,737	394	416
Thailand	52,000	33	5	720	150	27	630	715	176	200	478	560	117	150
Turkey	52,500	39	17	1,100	550	29	699	880	534	540	861	840	454	450
United Arab Emirates	1,000	0	0	0	0	15	7	7	0	0	0	0	0	0
Vietnam	60,000	30	1	120	35	2	66	66	55	55	60	60	25	25
Yemen Arab Rep.	6,000	0	0	0	0	<1	2	2	0	0	0	0	0	0
Yemen Dem. Rep.	2,200	0	0	0	0	2	2	2	0	0	0	0	0	0
Asia	**2,797,063**	**1,389**	**299**	**52,023**	**28,004**	**35**	**45,109**	**49,517**	**23,843**	**25,509**	**41,061**	**46,080**	**18,804**	**20,111**

Note: some figures are estimates. See individual country listings for details.

1. Import figures are for Belgium-Luxembourg. 2. People's Rep. China has an approximate total of 5,000 paper mills and 9,000 pulp mills. Only those with a capacity figure greater than 30,000 tpy are included here.

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Continent/ country	Popu- lation (1,000)	Number of mills		Capacity (1,000 tons)		Per capita (lb)	Apparent consumption (1,000 tons)				Production (1,000 tons)			
							P&B		Pulp		P&B		Pulp	
		P&B	Pulp	P&B	Pulp		1986	1987	1986	1987	1986	1987	1986	1987
LATIN AMERICA														
Argentina	31,000	100	25	1,300	900	75	1,058	1,140	701	708	991	1,064	723	725
Bahamas	200	0	0	0	0	165	15	15	0	0	0	0	0	0
Barbados	300	0	0	0	0	51	7	7	0	0	0	0	0	0
Belize	200	0	0	0	0	33	3	3	0	0	0	0	0	0
Bolivia	6,200	1	0	2	0	7	21	21	0	0	1	1	0	0
Brazil	141,500	146	38	5,364	4,474	64	4,114	4,337	3,141	3,260	4,525	4,676	3,997	4,031
Chile	12,327	7	7	423	876	53	296	350	285	338	388	442	848	861
Colombia	30,346	24	5	560	264	38	528	573	281	293	457	488	234	247
Costa Rica	2,655	2	1	18	25	99	120	122	7	7	12	12	6	6
Cuba	10,105	9	3	150	60	71	325	325	90	90	125	125	40	40
Dominican Rep	6,588	2	0	15	0	22	65	64	4	4	9	9	0	0
Ecuador	10,000	5	1	65	35	13	59	97	6	17	59	67	6	6
El Salvador	5,072	3	0	50	0	29	67	67	12	12	29	29	0	0
Guatemala	8,070	4	1	50	0	26	95	95	5	5	35	35	0	0
Guyana	800	0	0	0	0	19	7	7	0	0	0	0	0	0
Haiti	5,800	0	0	0	0	2	6	6	0	0	0	0	0	0
Honduras	4,500	0	0	0	0	14	29	29	0	0	0	0	0	0
Jamaica	2,100	1	0	15	0	44	42	43	1	1	12	13	0	0
Mexico	82,000	64	15	3,337	947	64	2,405	2,398	1,117	1,259	2,470	2,575	772	800
Neth. Antilles	300	0	0	0	0	22	3	3	0	0	0	0	0	0
Nicaragua	3,000	0	0	0	0	18	24	24	0	0	0	0	0	0
Panama	2,038	3	0	30	0	90	83	83	1	1	28	28	0	0
Paraguay	3,722	3	0	25	0	15	26	26	0	0	13	13	0	0
Peru	20,207	14	3	361	311	27	250	285	178	217	184	214	122	145
Surinam	400	0	0	0	0	61	11	11	0	0	0	0	0	0
Trinidad/Tobago	1,200	0	0	0	0	62	34	34	0	0	0	0	0	0
Uruguay	3,000	5	2	83	27	37	51	54	33	36	54	48	24	26
Venezuela	19,000	12	3	791	175	89	768	833	308	396	612	675	88	101
Latin America	**412,630**	**405**	**104**	**12,639**	**8,094**	**56**	**10,512**	**11,052**	**6,170**	**6,644**	**10,004**	**10,516**	**6,860**	**6,988**
AUSTRALASIA														
Australia	16,249	18	19	2,035	1,100	315	2,325	2,373	1,073	1,174	1,642	1,678	870	964
Fiji	700	0	0	0	0	22	7	7	0	0	0	0	0	0
New Zealand	3,284	6	7	807	1,437	352	525	599	629	816	671	644	1,110	1,108
Papua New Guinea	3,500	0	0	0	0	4	6	6	0	0	0	0	0	0
Samoa	200	0	0	0	0	33	3	3	0	0	0	0	0	0
Australasia	**23,933**	**24**	**26**	**2,842**	**2,537**	**264**	**2,866**	**2,988**	**1,702**	**1,990**	**2,313**	**2,322**	**1,980**	**2,072**
AFRICA														
Algeria	22,025	6	3	160	170	18	180	180	95	95	110	110	35	35
Angola	7,950	2	1	30	45	5	19	19	15	15	15	15	15	15
Benin	4,000	0	0	0	0	2	4	4	0	0	0	0	0	0
Botswana	1,100	0	0	0	0	2	1	1	0	0	0	0	0	0
Burkina Faso	6,900	0	0	0	0	<1	1	1	0	0	0	0	0	0
Burundi	5,000	0	0	0	0	2	4	4	0	0	0	0	0	0
Cameroon	9,800	0	0	0	0	2	10	10	0	0	0	0	0	0
Central African Rep.	2,700	0	0	0	0	<1	1	1	0	0	0	0	0	0
Chad	5,200	0	0	0	0	<1	1	1	0	0	0	0	0	0
Congo	1,800	0	0	0	0	1	1	1	0	0	0	0	0	0
Egypt	49,000	16	3	180	80	24	522	550	90	100	147	160	60	70
Ethiopia	42,290	1	0	15	0	1	20	21	4	4	10	11	0	0
Gabon	900	0	0	0	0	5	2	2	0	0	0	0	0	0
Gambia	800	0	0	0	0	6	2	2	0	0	0	0	0	0
Ghana	13,200	0	0	0	0	2	9	9	0	0	0	0	0	0
Guinea	5,700	0	0	0	0	2	4	4	0	0	0	0	0	0
Ivory Coast	10,180	7	0	80	0	26	121	123	83	124	44	46	0	0
Kenya	23,000	5	6	103	100	10	107	119	74	100	96	106	70	96
Lesotho	1,500	0	0	0	0	2	1	1	0	0	0	0	0	0
Liberia	2,200	0	0	0	0	1	1	1	0	0	0	0	0	0
Libya	4,000	10	0	10	0	8	14	14	6	6	6	6	0	0
Madagascar	10,000	2	2	28	7	2	11	8	9	7	11	8	5	4
Malawi	7,900	0	0	0	0	2	9	9	0	0	0	0	0	0
Mali	7,700	0	0	0	0	<1	1	1	0	0	0	0	0	0
Mauritania	1,700	0	0	0	0	5	4	4	0	0	0	0	0	0
Mauritius	1,000	0	0	0	0	13	6	6	0	0	0	0	0	0
Morocco	24,800	8	1	126	100	16	181	184	32	53	109	115	81	101
Mozambique	13,776	2	0	10	0	3	17	17	3	1	2	2	0	0
Niger	6,500	0	0	0	0	1	3	3	0	0	0	0	0	0
Nigeria	95,000	5	2	170	140	9	403	403	44	51	77	79	32	39
Rwanda	4,600	0	0	0	0	2	5	5	0	0	0	0	0	0
Senegal	6,600	0	0	0	0	1	4	4	0	0	0	0	0	0
Sierra Leone	3,900	0	0	0	0	<1	1	1	0	0	0	0	0	0
Somalia	7,600	0	0	0	0	<1	2	2	0	0	0	0	0	0
South Africa	32,465	17	10	2,000	2,160	88	1,295	1,260	1,265	1,230	1,611	1,581	1,875	1,840
Sudan	21,500	2	0	12	0	5	45	50	4	4	9	10	0	0
Swaziland	650	0	1	0	180	7	2	2	181	180	0	0	181	180
Tanzania	21,733	2	2	60	65	5	45	55	25	35	25	35	25	35
Togo	3,000	0	0	0	0	2	2	2	0	0	0	0	0	0
Tunisia	7,352	5	1	30	25	27	90	90	30	30	30	30	20	20
Uganda	14,735	1	0	5	0	<1	5	5	0	0	2	2	0	0
Zaire	32,985	1	0	4	0	<1	10	11	2	2	2	3	0	0
Zambia	7,535	1	0	10	0	2	5	7	2	0	5	3	0	0
Zimbabwe	8,400	3	2	90	40	22	85	84	55	59	78	80	32	37
Africa	**560,676**	**96**	**34**	**3,123**	**3,112**	**13**	**3,256**	**3,281**	**2,019**	**2,096**	**2,387**	**2,402**	**2,431**	**2,472**
TOTAL WORLD	**4,829,457**	**4,091**	**1,161**	**236,981**	**188,827**	**92**	**202,596**	**214,366**	**147,747**	**155,820**	**203,379**	**215,811**	**148,601**	**155,856**

TOP 20 PRODUCING NATIONS

Taiwan

Population: 19,725,000. Per capita consumption of paper and board: 144 kg/317 lb. Paper and board mills: 152. Pulp mills: 3 (sulfate: 2; nonwood: 1).

Paper/board capacity: 3,170,000 tons **Pulp capacity:** 500,000 tons
Operating rate 1987: 86% **Operating rate 1987:** 83%

(000 metric tons)

	Production		Imports		Exports	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	1,917	2,091	156	234	69	68
Board	610	646	12	54	80	78
Total	**2,527**	**2,737**	**168**	**288**	**149**	**146**
Chemical woodpulp	314	331	282	335	79	65
Bleached bagasse	70	73	—	—	28	16
Mechanicals, other pulps	11	12	32	44	1	1
Total	**394**	**416**	**314**	**379**	**108**	**82**
Market pulp	326	328	314	379	108	82

United Kingdom

Population: 56,650,000. Per capita consumption of paper and board: 154 kg/339 lb. Paper and board mills: 93. Pulp mills: 6 (semichemical: 2; mechanical: 2; nonwood: 2).

Paper/board capacity: 4,351,000 tons **Pulp capacity:** 490,000 tons
Operating rate 1987: 96% **Operating rate 1987:** 80%

(000 metric tons)

	Production		Imports		Exports	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	2,872	3,074	3,817	4,232	367	410
Other paper/board	1,069	1,110	940	1,051	263	322
Total	**3,941**	**4,184**	**4,757**	**5,283**	**630**	**732**
Chemical woodpulp	—	—	1,465	1,737	3	1
Mechanicals, other pulps	—	—	222	203	2	3
Total	**399**	**389**	**1,687**	**1,940**	**5**	**4**
Market pulp	—	—	—	—	—	—

United States

Population: 243,773,000. Per capita consumption of paper and board: 303 kg/666 lb. Paper and board mills: 555. Pulp mills: 219 (sulfate: 117; sulfite: 18; semichemical: 39; mechanical: 65).

Paper/board capacity: 70,780 tons **Pulp capacity:** 55,170 tons
Operating rate 1987: 95% **Operating rate 1987:** 98%

(000 metric tons)

	Production		Imports		Exports	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	53,844	56,646	10,256	10,864	2,847	2,978
Board	10,464	10,899	95	137	842	1,079
Total	**64,308**	**67,545**	**10,351**	**11,001**	**3,689**	**4,057**
Chemical woodpulp	45,607	47,663	3,878	,4138	3,378	3,749
Mechanicals, other pulps	6,119	6,374	278	263	667	687
Total	**51,726**	**54,037**	**4,156**	**4,401**	**4,045**	**4,436**
Market pulp	6,879	7,374	2,832	2,935	4,055	4,373

U.S.S.R.

Population: 275,000,000. Per capita consumption of paper and board: 40 kg/88 lbe. Paper and board mills: 84. Pulp mills: 57.

Paper/board capacity: 11,500,000e tons **Pulp capacity:** 10,000,000e tons

(000 metric tons)

	Production		Imports		Exports	
	1986	**1987**	**1986**	**1987**	**1986**	**1987**
Paper	6,156	6,435e	512	520e	688	700
Board	4,239	4,601e	102	105e	471	475
Total	**10,395**	**11,036e**	**614**	**625e**	**1,159**	**1,175**
Chemical woodpulp	9,363e	9,910e	—	—	1,105	1,105
Mechanicals, other pulps	1,600e	1,700e	—	—	—	—
Total	**10,963e**	**11,610e**	**350**	**350e**	**1,105**	**1,105**
Market pulp	—	—	—	—	—	—

the country's economic performance was seen in 1987. Paper and board output grew 4.3%, to over 2.5 million tons. Some restructuring is in progress within the paper industry, with Grupo Industrial Durango taking a lead. This company, which acquired the 100,000-tpy Atenquique pulp mill from the government last year, has also acquired the Centauro project, a large linerboard paper machine crated and awaiting construction since 1981. Durango, which last year also became the country's first supplier of market CTMP, plans to start the linerboard machine late next year. ■

EUROPE

All of Europe, western and eastern, made more paper and board than ever before; it also used more. Output in 1987 was 71.7 million tons, up 5.4% from 1986, making a five-year run of annual records for a total increase of 23% since 1982. Apparent consumption has behaved in a similar fashion but at a slightly slower pace: 67.4 million tons in 1987, up 4.7% from 1986, continuing five years of record-breakers for a total increase of 19%. Demand for newsprint and other printing papers was particularly strong, beating many forecasts and confounding the predictions of oversupply. The growth of new capital investment in western Europe has continued apace in all paper and board sectors as well as in pulp.

Pulp production also continued to climb. In 1987, it totaled 47.2 million tons, up 4.7% from the previous year, while consumption just passed 50 million tons for the first time, up 5.2%. For both, 1987 was the fifth record year in a row.

Of the 12 nations of the European Community (EC), half had record production years to give a total paper and board output of 32.8 million tons, an increase of 5.7%. Notable among these was Belgium, which joined the million-ton club for the first time. The dominant producer, Fed. Rep. Germany, which makes one-third of the EC total, enjoyed yet another record year. However, it did not enjoy the effect of a strong currency on its export trade nor the advantages that it brought competing importers, who won more of an expanding home market than domestic mills. By contrast, export tonnage increased by 12% but by only 5% by value.

French pulp and paper mills had an excellent year, and both the amount of capital investment in new capacity and the level of foreign interest are increasing fast. What happens in France may mirror what is already happening in the U.K. It continued to enjoy its revival, particularly in the newsprint sector. As two more greenfield mills plus other expansions are planned, it is likely to become increasingly self-sufficient, although foreign ownership of the industry continues to increase as well. Italy moved out of the doldrums, and producers had a good year helped by a 10.5% rise in apparent consumption to a record level, though imports also increased. The slow process of restructuring, essentially fewer big mills owned by fewer companies, continues.

Spain and Portugal joined the EC in 1986, bringing significant new pulp capacity, over 3 million tons, mostly of popular eucalyptus pulp. While their pulp industries benefited from the increase in market prices in 1987, their paper industries are seeing rising consumption met by rising imports, made easier by EC membership. But this factor aside, Spain's paper mills have had three good years and further expansion is expected. Portugal, on the other hand, was one of the few countries where paper output declined in 1987, partly because of a rebuild at a major kraftliner producer. However, several expansion programs are being planned.

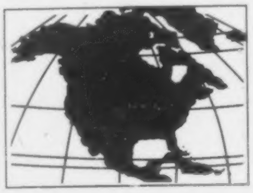
"Full capacity utilization" was the most common term used to describe 1987 for the three Nordic nations, which depend strongly on their exports of forest products. Finland crossed 8 million tons of paper and board output for the first time, and Sweden is expected to do so this year. By contrast, Norway's output has stayed around 1.6 million tons for the last three years, and for some sectors output was limited by capacity.

Strong demand on world markets, particularly the EC, for main exports (pulp, newsprint, printing/writing papers and kraftliner) meant their mills had a highly productive and profitable year. In both countries, a period of mergers and acquisitions is resulting in larger, more internationally competitive companies, most of which are undertaking considerable expansion in pulp and papermaking capacity. These countries are additionally continuing the process of buying into the EC's papermaking and paper-distribution chain, in preparation—along with some trepidation—for the single open internal market planned by the EC for 1992.

Austria too is concerned about this development, as it also depends on this market for its exports. Last year was its eleventh record year in a row, though each annual increase has been modest. Further expansions are being completed, such that the export trade will become more important. Partly for this reason, a lobby group in Austria wants it to apply for EC membership.

The fact that the three Nordic nations alone make nearly as much as all the eastern European nations, including the U.S.S.R., reflects both the Nordic dynamism and the difficulties facing some of the eastern Europeans. Shortages of raw materials and economic problems have kept capital investment low in this industry for most of these countries. However, they should not be underrated in the future, as the potential exists for higher output as soon as conditions permit.

One exception is the U.S.S.R. Preliminary figures indicate output once again reached a record level, and several capital investment projects are planned, some with foreign partners. ■



NORTH AMERICA

Last year was a highly profitable one for pulp and paper producers in North America. Domestic demand was strong, increasing at rates that were higher than GNP, and exports were assisted by the low value of the U.S. dollar against other currencies. Pulp and paper mills operated at near full capacity, and many of them recorded record profits for the year.

Total North American output of paper and board reached a record-high 83.6 million tons in 1987, up 5% from 1986. Among individual grades, newsprint output was up 4% at 14.97 million tons, printing/writing papers were up 6.5% at 21.25 million tons, and packaging grades were up 5.1% at 28.43 million tons (kraft linerboard production rose 7.1% to 16.88 million tons). Total imports rose by 6.1% to 11.7 million tons, while total exports reached 15.2 million tons, up 7.3% from 1986.

Pulp output climbed to 77.1 million tons, also up by about 5%. Output of market pulp was 15.4 million tons, a rise of 8% from 1986. Pulp exports were 11.9 million tons, an increase of 6.6%.

Domestic demand for paper and board was strong. The American Paper Institute estimated that real per capita consumption in the U.S. climbed above 300 kg (660 lb) for the first time to 302.5 kg (665.5 lb). Apparent consumption—not allowing for stock holding—was at 291.1 kg (640.4 lb).

Printing/writing papers shipments in the U.S. were up 5.9% to 18.6 million tons, reflecting the 6.9% growth in output of the printing and publishing industry and a 12% increase in the use of office copy papers. U.S. output of casemaking materials was 6.7% above 1986 at 23.12 million tons, with production destined for the domestic market increasing 7.5% and exports increasing 4.7% at 2.14 million tons.

Canada's industry recorded total shipments in 1987 of 24.3 million tons, or 98% of installed capacity. Newsprint, packaging, and market pulp sectors all operated at 98% or 99% of capacity. Printing/writing papers shipments increased 9% to 3.1 million tons, in line with fast-growing demand from the U.S. and Canada. Packaging paper and board shipments were 3,275,000 tons, an increase of 4% from 1986. Shipments of newsprint were up 4% to 9.7 million tons, and shipments into the U.S. and Canadian markets were up 5%. Market pulp exports were up 4%, or 300,000 tons.

In 1988, it seems likely that new output records will be established. GNP growth will probably be be 2% to 2.5% for the year in both Canada and the U.S., and paper and board output and demand is expected to increase at the same rate. ■

ISSUE FOCUS: **WORLD REVIEW**

U.S. PRODUCERS SHOULD START LOOKING SOUTH FOR FAST-GROWING MARKETS

Companies should shift focus from the Far East to Central America and Mexico, where fast population growth presages strong demand

By REGINA McGRATH, News Editor

By the year 2000, between 22% and 25% of U.S. exports of paper and allied products could be crossing the border to Mexico and the Caribbean—a 17% increase over 1987 levels. This forecast is based largely on the fact that population in these areas will grow rapidly during the period. Consumer expectations will rise along with per capita income and spending, fueling demand for more sophisticated paper products. Increased tourism will augment these trends.

These are some of the conclusions reached in a study recently released and subsequently updated by the Forest Products Office of the U.S. Dept. of Commerce entitled *Developing Paper Products Markets in Mexico & the Caribbean*. The regions included in the study are Central America, the northern part of South America (including Colombia and Venezuela) and the island nations of the West Indies. Population in this area was estimated at 190 million in 1987. In that year, combined Mexican and Caribbean purchases of U.S. paper products surpassed dollar sales to Canada and Japan and were second only to the value of shipments sent to the European Community, Commerce reports.

One of the few generalizations that can be made about this region is that deforestation is occurring at an alarming rate. Costa Rica, Panama, and Venezuela have virtually banned commercial logging on most of their timberland. Much of the wood harvested in this area is used for firewood or is burned to provide farmland for the growing population. The political turmoil in which some of these countries find themselves is not conducive to making and implementing a long-term reforestation policy. The study concluded that by the year 2000, the rate and area of deforestation in this region will continue to exceed reforestation.

The U.S. will continue to play a leading role in supplying both woodfiber and wastepaper to these countries but should prepare itself to face stiff competition from Brazil, Chile, Canada, Scandinavia, and maybe Southeast Asia, the study's authors, L. Smith and G. Stanley, caution. Excluding secondary fiber, the region currently supplies approximately 30% of its total wood and nonwood fiber (bagasse) needs. It is unlikely that it will be able to improve on this percentage by 2000, the study notes.

Because of the lack of wood, wastepaper makes up a large part of the furnishes in paper mills of the region. Most of the paperstock is obtained from local recovery programs, but a large amount is imported from the U.S. Mexico is second only to Japan in wastepaper recovery, and about half of the raw material used in that country is wastepaper. For the region as a whole, wastepaper may constitute 40% or more of the region's annual papermaking requirements, the study says.

SATISFYING PAPER DEMAND. Because population in the region grew rapidly between 1974 and 1987, causing paper and board consumption to jump by over 50%, domestic producers of paper and pulp have been unable to satisfy domestic demand. In the last couple of years, domestic mills have accounted for 20% of the pulp and 30% of the paper and board consumed in the region. U.S. mills have traditionally made up most of the shortfall.

In 1987, U.S. paper industry exports to the area amounted to $1.1 billion—a 23% increase from 1986 levels, the Dept. of Commerce reports. U.S. exports of paper and allied products made up over 75% of all such exports to the region. This represents more than a 5% increase in U.S. market share from the prior year, due in part to increased tourism, increased regional business activity, and some strengthening of local currencies against the weak U.S. dollar, Commerce reports.

SHIPPING TO THE U.S. In 1987, shipments of paper and converted paper products from Mexico and the Caribbean to the U.S. were valued at $297 million—an 8% boost over the prior year. Mexico accounted for 90% of the total. (The updated study notes that Mexico was the third largest supplier of paper products to the U.S. in 1987, behind Canada and Finland, and is projected to reach second place by the year 2000.) An increasing number of small converting facilities, especially in the printing/writing and sanitary tissue grades, are projected to start up in the region in the next few years.

PLANS FOR IMPORT SUBSTITUTION. Mexico is almost self-sufficient in supplying its own paper and board needs. In 1986, it produced 2.47 million metric tons of paper and board, accounting for 97% of the country's total apparent consumption. Although U.S. export tonnage to Mexico rose by about 14% between 1985 and 1986, the increase was due mostly to increased exports of wastepaper and paperboard, while purchases of primary paper and board grades declined by 25.5% and 20.6%, respectively. The study notes that Mexico's huge debt will probably curtail state-sponsored expansion projects. In 1986, Mexico imported about 326,500 tons of pulp.

The study's authors note that tissue production is one of the most dynamic sectors of Mexico's industry. This sector is dominated by Kimberly-Clark de Mexico and Scott-San Cristóbal, which together account for almost 95% of the domestic sanitary tissue capacity in the country (about 350,000 tpy). As a result of its expertise in tissue production, Mexico has begun to export this grade to countries in Central America.

COLOMBIA. Since it produces none of its own, Colombia currently imports about 80,000 tpy of newsprint. Carton de Colombia SA, a subsidiary of Jefferson Smurfit Corp., has said it plans to spend $200 million to construct a 100,000-tpy newsprint mill in Colombia, but the project is opposed by newspaper publishers and could be hampered by the increasing violence that is tormenting the country. Colombia also imports significant quantities of pulp. In 1987, the U.S. sold Colombia $42-million worth of paper and related products, over half of which was kraft linerboard.

VENEZUELA. The idea of building a $600-million pulp and paper complex has been kicked around in Venezuela for some time. Called the Orinoco project, it would produce the country's first newsprint as well as make chemi-thermomechanical pulp (CTMP) and kraft linerboard. If the mill is built, it would eliminate approximately $6 million in business for U.S. newsprint exporters and would also make Venezuela self-sufficient in pulp in the near term. Venezuela may well scrap these plans in light of the fact that Abitibi-Price Inc. and Bowater Inc. are building a 200,000-metric-tpy greenfield newsprint mill near Ciudad Guayana. The two North American companies will each hold half of a 49% share in the mill, with the government and a group of publishers holding the controlling stake. It is unclear how much of the mill's output will be sold in Venezuela, since most of the mill's output is to be exported and marketed independently by Abitibi and Bowater. In 1987, the U.S. supplied over 60% of Venezuela's pulp and paper needs, with exports to that country amounting to $138 million.

CENTRAL AMERICA. One pulp mill and a dozen paper and board mills are located in Central America. Celgusa of Guatemala was slated to start up a 200,000-tpy kraft pulp mill in 1986, but construction has stalled due to a large project debt (about $250 million) and a lack of available wood reserves to supply the mill. It is said that the government has taken over the project and halted construction.

Central America is competing on the world market to some degree in converted sanitary paper products. Again, K-C and Scott are the companies that dominate here. Scott Paper Co. has reportedly proposed that it combine operations with Convertidora Nacional de Papel y Carton of Honduras to produce nonwoven materials used to make disposable diapers and other products. Converted products is the logical area for expansion in Central America because these facilities do not require a large capital investment or a highly skilled work force.

Currently, Central America buys from the U.S. a lot of packaging materials, such as linerboard, corrugating medium, and boxboard, as well as printing/writing paper. In 1987, U.S. shipments of paperboard to Central America amounted to $110 million, accounting for 66% of U.S. paper exports to that region. Much of this containerboard is used to make boxes for shipping agricultural products.

To order a copy of the report, contact the U.S. Government Printing Office, Washington, D.C. 20402; (202) 275-3054. ■

TABLE 1: **U.S. exports to Mexico and the Caribbean in 1987 ($000).**

Country/market	Woodpulp	Wastepaper	Printing/ writing	Special industrial paper	Paperboard	Total sales[1]	1987 export share
Mexico	$165,811	$101,595	$10,988	$8,575	$49,570	$616,937	57.5%
Venezuela	77,563	7,267	11,337	3,644	26,294	137,516	12.8
Costa Rica	195	504	3,224	562	34,245	44,923	4.2
Panama	1,092	749	4,708	880	24,215	43,542	4.1
Colombia	3,790	584	3,373	1,145	26,995	41,699	3.9
Honduras	248	22	3,494	496	25,989	35,731	3.3
Guatemala	3,363	916	2,690	123	17,467	27,958	2.6
Dominican Rep.	326	176	2,537	364	10,190	22,229	2.1
Jamaica	—	3,198	2,247	558	16,846	18,026	1.7
El Salvador	349	—	2,996	566	8,137	14,203	1.3

[1] Columns do not add to total because some export categories are not listed.

Source: Bureau of the Census, U.S. Dept. of Commerce.

PULP & PAPER

September 1988

C3975-2
9/15/88

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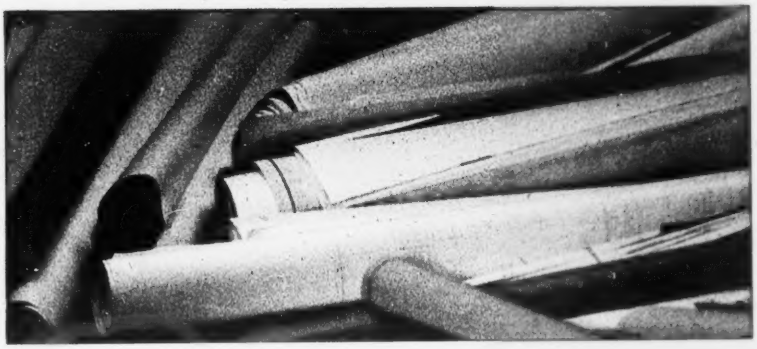
Special Report:

THE ENGINEERING CRUNCH 54

Projects stack up as shortage of engineers threatens continued growth

Volume 62
Number 9

SEPTEMBER



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THE COVER

Record expansion/modernization projects in the North American paper industry have literally jammed engineers' desks as well as paper machinery factories and construction work schedules, exceeding manpower capacity and possibly causing a near-future growth slowdown. (See special section, "The Engineering Crunch," which begins on p. 54). **(Staff photo composed at Sandwell Swan Wooster Inc., Atlanta, Ga., by Kelly H. Ferguson.)**

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News, Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.
POSTMASTER: Please send addresses changes to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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Subscriptions & Address Change: Sent without charge to the U.S.A. & Canada (upon written request) to individuals in pulp, paper, and board manufacturing firms and paper converting firms. To all others there is a subscription charge of $60.00 a year in the U.S. All subscriptions to other countries: $80.00 a year, except Europe and Mediterranean, $90.00 (air service included). Single copy, $6.00, except Buyers Guide, $30.00. Photocopies of articles and complete microform volumes available through University Microfilms International, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106.

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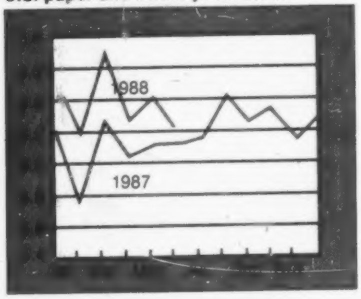
MONTH IN STATISTICS

U.S. paper and board production



U.S. paper and paperboard production totaled 6.2 million tons in June, an increase of 1.7% over the same month last year, the American Paper Institute reports. On a seasonally adjusted basis, production through the first half of the year was at a record rate of 76.5 million tpy, up 4.2% from 1987. After growing at a rate of 5.4% for the four quarters of 1987, however, production growth has slowed considerably in 1988, API reports. The annual rate for the first two quarters of 1988 was just 2.0%, reflecting 3.0% growth for paper and only 0.4% for paperboard.

Among major grades, printing and writing papers continued strong in June, with the highest growth in coated papers, up 11.2% from last year. Reflecting tight markets, unfilled orders for uncoated free-sheet were up 45.6% from June 1987. Containerboard production for domestic use was up 4.6%, but unbleached kraft linerboard exports through May were down 0.1%.

Canadian newsprint shipments totaled 851,000 metric tons in June, unchanged from a year earlier. Woodpulp exports totaled 699,000 tons, down a sharp 8.4% compared with June 1987. Operating rates through the first half were 96% at pulp mills and 99% at newsprint mills. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
[illegible]					
Newsprint	June	490	--	5,977	4.5
Uncoated groundwood (s)	June	123	2.5	1,560	3.4
Coated paper (s)	June	599	5.3	7,382	11.2
Uncoated free sheet (s)	June	899	-1.7	11,298	5.8
Other printing/writing	June	115	5.5	1,508	9.6
Total packaging and other paper (s)	June	421	3.4	5,215	2.1
Tissue	June	450	2.5	5,427	3.7
Total paper	**June**	**3,096**	**1.6**	**38,368**	**5.6**
Unbleached kraft paperboard	June	1,583	0.6	19,346	4.7
Semichemical medium	June	466	--	5,677	1.4
Bleached paperboard	June	366	5.5	4,447	0.4
Recycled paperboard	June	734	4.0	8,964	6.1
Total paperboard	**June**	**3,150**	**1.9**	**38,434**	**3.9**
Total U.S. paper and paperboard output	**June**	**6,246**	**1.7**	**76,802**	**4.7**
[illegible]					
Total U.S. woodpulp production	May	4,991	1.9	60,980	3.9
Market pulp production	May	642	0.8	8,286	6.2
Wastepaper consumption at paper/board mills	May	1,611	7.4	18,951	9.3
Pulpwood consumption (cords)	May	7,650	-0.9	96,005	2.8
[illegible]					
Corrugated box shipments (billion ft³)	June	25.830	1.3	153.686[6]	4.4
Containerboard inventories at U.S. box plants and mills	June 1	2,595	8.9		
[illegible]					
U.S. paper imports (including products)	May	1,095	6.9	12,905	4.1
Imports of Canadian newsprint	May	741	0.5	8,633[6]	-0.6
U.S. paper exports (including products)	May	452	12.4	5,835	16.8
Exports of unbleached kraft linerboard	May	160	-2.4	2,171	-0.1
Exports of woodpulp	May	433	14.9	5,306	15.4
Norscan pulp inventories[4]	June 30	670	-15.7		
Norscan pulp operating rates[4]	June	96%	90%	95%	98%
[illegible]					
Total newsprint shipments	June	851	-0.7	4,874[6]	0.7
Operating rates	June	97%	97%	99%	98%
Inventories held by U.S. consumers	June 30	1,539	9.5		
Other paper/board shipments	June	568	8.4	3,368	6.4
Woodpulp shipments (export only)	June	699	-8.4	4,013	0.9
Operating rates	June	99%	99%	96%	97%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council. 4. North American/Scandinavian paper-grade market pulp. 5. Canadian Pulp & Paper Assn. 6. Not annualized. (s) = Shipments.

Uncoated groundwood: Markets tighten, prices continue to rise in virtually all segments

Grade structure: Uncoated groundwood papers are essentially value-added newsprint in that their physical properties have been enhanced by superior brightness and smoothness. Supercalendering (SC) adds a glossy finish that allows higher-quality papers to compete with lightweight coated (LWC) groundwood papers. Brightness levels range from 64 to 74 Elrepho, compared with 56 to 62 for standard newsprint. Major end uses include Sunday newspaper magazines, preprinted newspaper inserts and direct mail flyers, catalogs, telephone directories, and business forms. Basis weights range from 20 to 45 lb/3,300 ft^2.

Production/capacity: North American production of groundwood papers continued on an upward trend as some mills converted newsprint machines to groundwood specialties. Shipments by U.S. mills actually dropped to less than 1.5 million short tons in 1987, or 3.2% less than 1986. Canadian shipments, on the other hand, rose 9.8% to 1.338 million metric tons (1.475 million short tons). Most of that paper headed south.

Capacity in Canada and the U.S. is rising. This includes conversions such as Abitibi-Price Inc.'s mills in Alma (directory paper) and Jonquière (SC-grade A/web-size offset paper), Que., and new capacity at mills such as Lake Superior Paper Industries Inc. (SC) in Duluth, Minn. Canadian capacity will rise to about 14.6% from 1988 to 1989, while in the U.S. the increase will be just 0.9% to 1.882 million tons.

New capacity includes the following: Consolidated-Bathurst Inc., Grand'Mère, Que., (110,000 short-tpy net, 1989); St. Marys Paper Inc., Sault Ste. Marie, Ont., (125,000 short-tpy net, 1988); and F.F. Soucy Inc., Rivière-du-Loup, Que., (22,000 short tpy, rebuild, 1989). St-Raymond Paper Ltd. is adding incremental directory paper capacity at St-Raymond, Que., this year and has brought online all 70,000 tpy at the former Pejepscot mill in Maine. Daishowa America has proposed a new 150,000-tpy directory paper machine in Port Angeles, Wash.

Some overcapacity may occur in 1989 and 1990. A mild recession in late 1989 and 1990 and better availability of newsprint and LWC will be the causes. North American demand for uncoated groundwood paper will grow 500,000 short tons by 1990, yet capacity will increase 934,000 short tons.

Outlook: Fairly stable growth rates of 5%/year are expected for the next several years in major end-use markets for uncoated groundwood.

Directory paper will grow at an average 3.6% annually through 2000 at the seven regional Bell operating companies (RBOCs). This growth is slower than the high single-digit or low double-digit rates experienced by the independent publishers, who use from 15% to 20% of the tonnage.

Analysts say SC paper will account for about 16% of the catalog paper market by 1995, up from 4% in 1986. Some of that growth will come at the expense of machine-finished grades as well as from general growth in catalogs.

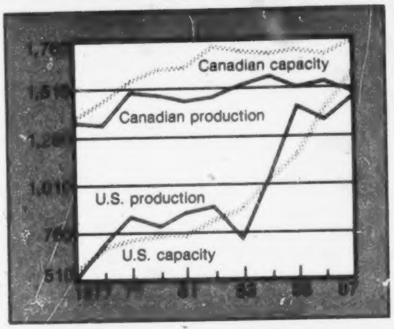
Office electronics are creating opportunities for groundwood producers who manufacture basestocks for computer forms. The number of small, inexpensive computer printers is expected to grow rapidly.

Preprinted advertising inserts grew at a compound annual growth rate of 14% from 1970 to 1986. Growth may be as high as 12% in 1988 and 8%/year for the longer term.

Prices: Prices on all grades have been rising, pushed up from the bottom by newsprint and pulled from the top by LWC.

List prices for 34-lb supercalendered ($/short ton) are: 1986, $735; 1987, $704; midyear 1988, $780. Prices for 35-lb offset, 65 brightness forms: 1986, $537; 1987, $565; midyear 1988, $660. For standard 30-lb rotonews: 1986, $493; 1987, $541; midyear 1988, $647. For 15-lb, 65 brightness forms: 1986, $520; 1987, $560; midyear 1988, $695.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

U.S.	**1986**	**1987**	**1988e**
Production[1]	1,540	1,491	1,613
Capacity[1]	1,685	1,756	1,865
Utilization rate	91.4	84.9	86.5
Imports	1,028	1,270	1,602
Exports	41	56	51
Apparent U.S. consumption	2,527	2,705	3,164
lb/capita	20.98	22.26	25.80
GNP ratio[1]	0.68	0.71	
Canada			
Production[2]	1,343	1,475	1,683
Capacity[2]	1,391	1,598	1,772
Utilization rate	96.5	92.3	94.9
Exports	1,138	1,253	1,382

e = Estimate.
1. American Paper Institute.
2. Canadian Pulp & Paper Assn.

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity			**Market share**
	U.S.	**Canada**	**Total**	**(%)**
1. Abitibi-Price	—	440	440	9.6
2. MacBlo	—	435	435	9.5
3. CIP	—	425	425	9.3
4. ConBath	—	380	380	8.3
5. Boise Cascade	—	325	325	7.1
6. GN Nekoosa[1]	303	—	303	6.6
7. Champion[2]	275	—	275	6.0
8. Domtar	—	190	190	4.1
9. Kimberly-Clark	131	41	172	3.8
10. Madison	165	—	165	3.6

Capacity share of top five companies:
43.8%
Capacity share of top ten companies:
67.9%
North American capacity (1988): **4.580e**
U.S.: **1. 865** Canada: **2.715**[3] **million short tons**

e = *P&P* estimate.
1. Millinocket, Maine, mill.
2. 1987 production.
3. Canadian Pulp & Paper Assn. estimates 1988 capacity at 1.644 million tons; does not include rotonews and some other groundwood capacity.

SALES & EARNINGS

Second-quarter 1988 earnings surged 50.3%

U.S. pulp and paper companies rolled up a 50.3% jump in earnings for second-quarter 1988 on a 15.6% increase in sales, according to a *Pulp & Paper Week* survey of 29 companies. This follows a 60% jump in profits in the first quarter.

Although earnings growth appears to have been modest between the first and second quarters, several companies are predicting record profits for 1988. Many companies echoed the sentiments of Bowater Inc. chairman and CEO A.P. Gammie, who noted, "In contrast to all the uncertainties being heard about the rest of 1988 and 1989, our order books are full, the customers for our main products are enjoying good business conditions, and we expect 1988 to continue to be our best year so far."

International Paper Co. again led the U.S. industry profit parade. Chairman and CEO John A. Georges attributed the doubling in income to "continued strong demand for nearly all our products and the price increases we have realized on all our major product lines." He also singled out the performance of the nonwovens division, Fibertec, which the company acquired last year from Kendall. Georges said he is expecting steady, moderate improvement in earnings for the company for the rest of the year.

Weyerhaeuser Co. saw its profits jump 68.8% to $150 million. The excellent returns came despite extensive scheduled maintenance downtime at most mills and a three-week shutdown of its New Bern, N.C., market pulp mill following the accidental rupture of a bleaching tank. Income from these operations will be "significantly higher" in the rest of the year, chairman and CEO George H. Weyerhaeuser predicted. Weyerhaeuser expects the performance of the company's forest products operations in the third quarter to be somewhat improved over a year earlier.

Georgia-Pacific Corp. had the most sales of any company surveyed at $2.42 million. T. Marshall Hahn Jr., chairman and CEO, said that operating profits for the company's pulp and paper business set a new second-quarter record at $133 million (prior to a one-time gain in 1987). Georgia-Pacific benefited from strong demand both at home and abroad for pulp and linerboard as well as from good domestic demand for uncoated free-sheet. "We expect demand for these products to remain healthy during the second half as Georgia-Pacific completes significant capacity expansions at our Monticello, Miss., and Port Hudson, La., pulp and paper mills and as we finalize our acquisition of Brunswick Pulp & Paper Co.," Hahn said. Profits from the building products segment declined 16.6% from the year-earlier period because of the effects that interest rates are having on housing starts.

James River Corp. completed its fiscal year in April with record earnings of $209 million—a 23% increase over the prior year. The company's fourth-quarter profits were up 28.9%, largely due to the performance of the printing/writing papers, specialty papers, and paperboard packaging busi-

U.S. paper industry results.

	Second quarter ($000)			
Companies	**Sales**	**Change 1988/87**	**Earnings[1]**	**Change 1988/87**
Boise Cascade Corp.	$1,007,180	7.6%	$72,230	105.0%
Bowater Inc.	351,627	18.4	40,802	143.6
Champion International[2]	1,262,373	8.7	112,193[2]	67.1
Chesapeake Corp.	184,723	5.5	11,927	67.1
Consolidated Papers	221,731	25.0	39,013	104.0
Federal Paper Board[2]	248,222	3.0	28,847[2]	71.8
Fort Howard Corp.	503,162	6.5	46,912	−3.8
Gaylord Container Corp.	188,200	46.2	12,400	85.1
Georgia-Pacific Corp.[2]	2,418,000	15.4	118,000[2]	−20.3
P.H. Glatfelter Co.	143,437	40.8	21,002	47.9
GN Nekoosa Corp.	856,900	49.0	85,300	90.0
International Paper Co.	2,400,000	26.3	188,000	108.9
James River Corp.	1,394,885	17.1	59,056	28.9
Jefferson Smurfit Corp.	321,864	19.0	36,673	83.9
Kimberly-Clark Corp.	1,340,700	9.5	100,100	19.5
Longview Fibre Co.	169,733	20.6	29,411	90.9
Louisiana-Pacific Corp.[2]	474,200	13.5	39,000[2]	18.2
Mead Corp.	1,159,900	7.6	73,000	40.7
Pentair Inc.	203,912	3.9	9,862	234.8
Pope & Talbot Inc.	121,955	14.7	6,859	−4.9
Potlatch Corp	266,758	9.4	24,538	10.0
Scott Paper Co.	1,164,100	13.1	75,300	28.1
Sonoco Products Co.	418,669	22.3	26,260	42.5
Stone Container Corp.	858,700	3.3	78,100	140.3
Temple-Inland Inc.	448,500	13.5	53,100	48.3
Union Camp Corp.	660,076	11.8	74,080	54.9
Wausau Paper Mills Co.	74,297	16.5	4,570	57.5
Westvaco Corp. (4/30)	533,313	15.6	45,219	86.1
Weyerhaeuser Co.	2,094,656	18.4	150,569	68.8
Willamette Industries	424,583	20.5	42,318	52.4
Total	**$21,916,363**	**15.6%**	**$1,704,641**	**50.3%**

1. Income after taxes from continuing operations, excluding most significant nonrecurring items after taxes in both years when possible.
2. **Champion International:** 1987 quarter excludes pretax gains relating to the sale of the company's investments in Stone Container Corp. and U.S. Plywood Corp. and adjustment of a reserve. **Federal Paper Board Co.:** 1987 second-quarter earnings excludes $8.2-million charge from premium on retirement of debt. **Georgia-Pacific Corp.:** 1987 second-quarter earnings include pretax gain of $60 million from liquidation of investments. **Louisiana-Pacific:** Results have been restated to show Fibreboard Corp. as a discontinued operation.

nesses. Its towel and tissue earnings were depressed due to higher costs (mostly pulp) that had not yet been recovered through recent price increases. The company's flexible packaging business reported significantly lower earnings because of the rapidly escalating costs of styrene.

Full order books. Champion International Corp. recorded a 67% increase in earnings and is looking forward to a profitable third quarter thanks to the July 1 price increase on all coated and some uncoated grades. Newsprint earnings increased modestly from the first-quarter level. The July 1 price increase on market pulp will also help Champion, which sells about 250,000 tpy of pulp.

Mead Corp. enjoyed record sales and earnings for the second quarter and for the first half of 1988. The company reported strong order backlogs for its publication papers as well as new orders for its coated board, containerboard, pulp, and electronic publishing segments.

Consolidated Papers Inc. doubled its profits in the second quarter of 1988. Consolidated Papers' four paper mills operated at capacity, shipments increased, and prices were restored to 1985 levels.

Boise Cascade Corp. more than doubled its earnings. The company is expecting a record year in 1988 despite the ongoing strike by sawmill workers at 15 of the company's 28 wood products plants and softer markets for wood products.

A containerboard bonanza. Stone Container Corp. predicted earnings more than doubled to between $76 and $80 million. The company raised linerboard and box prices last spring, and cost reductions and productivity improvement also accounted for the big boost in earnings.

Jefferson Smurfit Corp. enjoyed an 84% increase in earnings—a new record high for the tenth consecutive quarter. Earnings in the first half of 1988 were 551% above those of first-half 1986, thanks to an improved operating environment and the acquisition of Container Corp. of America and an 80% stake in Publishers Paper. Smurfit is looking forward to reaping the benefits of a third-quarter price increase on solid bleached sulfate (SBS) and recycled boxboard. Smurfit said 10 of its 18 paper mills have set production records so far this year.

Federal Paper Board Co. Inc. saw profits rise 72%, setting a new record. The company expects to have record profits this year. A new recovery boiler at the Augusta, Ga., mill should help earnings gains in the next quarter. Gaylord Container Corp., which recently went public, saw its profits rise 85% in its first quarter.

Tissue results mixed. Scott Paper Co. enjoyed record profits for any quarter in its history. Scott's personal care business in the U.S. achieved record unit sales volumes as well as a 16% increase in income. Sales and income from S.D. Warren Co.'s printing and publishing papers business increased 11% and 34%, respectively, setting a second-quarter record.

Fort Howard Corp.'s profits were down 3.8%. The company said expenses relating to the pending buyout of the company reduced income by about $2.68 million (4¢/share). Profits were reduced by a similar amount by the strike at its Canadian cup manufacturing operations. High resin costs also limited profits. (Kimberly-Clark Corp.'s results were not available.)

Pope & Talbot Inc. was one of the few companies to show a decline in profits, and this occurred because of the 45-day strike at the company's Halsey, Ore., market pulp mill. Despite the strike, profits almost hit the record level set in 1987. ■

Canadian second-quarter earnings rose 27.6%

Canadian forest products companies enjoyed a 27.6% increase in profits on a 6.9% increase in sales during the second quarter. Canadian producers are still grappling with the strong Canadian dollar, which is cutting into the profits they can make in Europe and their biggest market—the U.S. Since the British Columbian pulp and paper mills managed to conclude labor negotiations without a strike, they will continue to profit from tight pulp markets in the third quarter. The slowdown in housing construction in North America curtailed demand for lumber in the quarter. Newsprint producers are still making money but not as much as they thought they would when the year started.

Canada saw two big mergers in the second quarter: CIP Inc. and Great Lakes Forest Products Ltd. are now doing business as Canadian Pacific Forest Products Ltd., and Crown Forest Industries Ltd. and British Columbia Forest Products Ltd. will operate as Fletcher Challenge Canada Ltd.

Canadian paper industry results.

	Second-quarter 1988 (C$000)			
Companies	**Sales**	**Change 1988/87**	**Earnings[1]**	**Change 1988/87**
Abitibi-Price Inc.	$835,500	10.5%	$54,400	50.3%
B.C. Forest Products	393,300	14.3	48,900	50.9
Canadian Pacific[2]	753,500	8.5	74,300[2]	48.3
Canfor Corp.[2]	279,500	−11.1	29,600	11.3
Cascades Inc.[2]	148,615	9.9	10,462[2]	−28.3
Consolidated-Bathurst	609,000	6.2	59,900	38.3
Domtar Inc.	646,000	−1.7	24,000	−45.5
Donohue Inc.	161,200	21.1	18,300	83.0
MacMillan Bloedel Ltd.	851,500	5.5	94,500	26.7
Noranda Forest Inc.	1,181,000	7.2	71,000	31.5
Repap Enterprises Inc.	249,100	5.2	21,300	54.3
Rolland Inc.	109,800	13.2	842	−19.9
Scott Paper Ltd.	79,868	5.9	4,246	15.9
Weldwood of Canada	237,484	25.0	20,256	77.5
West Fraser Timber	123,400	10.8	13,700	15.1
Total	**$6,658,767**	**6.9%**	**$545,706**	**27.6%**

1. Income after taxes from continuing operations, excluding significant nonrecurring items in both years when possible.
2. **Canadian Pacific Forest Products Ltd.:** results include those of Great Lakes Forest Products Ltd. and CIP Inc., which merged to form Canadian Pacific second-quarter 1988. **Canfor:** 1988 quarter excludes extraordinary gain of C$68.5 million from sale of assets to Howe Sound Pulp & Paper. **Cascades:** 1987 quarter includes C$7.0 million credit from tax-loss carry-forward.

Federal signs letter of intent to sell mill

Federal Paper Board Co. announced that it has signed a letter of intent to sell its 35-tpd Los Angeles, Calif., recycled boxboard mill and cogeneration facility to separate buyers, who were not identified. Federal has been seeking a buyer for the Los Angeles mill since November of last year, when it also put the 230-tpd Richmond, Va., recycled boxboard mill on the selling block. The Richmond mill was sold to Sonoco Products Co. in February.

Federal has also closed carton plants in Elkhart, Ind., and Los Angeles as part of its reduced emphasis on the recycled paperboard business, which has shown poor profitability in recent years. The thrust of the company's boxboard business is now focused on two solid bleached paperboard mills in Augusta, Ga., and Riegelwood, N.C., and a high-quality cylinderboard mill in Sprague, Conn.

Indicative of this new direction are the company's expansion programs at the solid bleached sulfate (SBS) mills and the acquisition in June of United Paper Inc., a bleached paperboard converter with sheeting operations in Sturgis, Mich., and Ontario, Calif.

Federal will retain the Sprague mill and has initiated a capital improvement program there that is expected to boost capacity from the current 500 tpd to 600 tpd over the next two years. The mill's twin-wire Inverform cylinderboard machine is one of the most efficient and productive machines of its kind in the industry, says Federal's president and CEO, John R. Kennedy.

The machine produces a clay-coated five-ply board using a furnish of old corrugated containers (OCC) and deinked newsprint. Federal is initially upgrading the stock cleaning system at the mill with the installation of five new Ultra screens supplied by Black Clawson. ■

World liner exports rose 5.4% from major suppliers

U.S. linerboard exports last year increased 5.4% to 2.29 million tons, second only to the record 2.5 million tons exported in 1980, according to the American Paper Institute's annual linerboard export report. "The very strong worldwide demand coupled with tight supply, plus the lower U.S. dollar, contributed to the sharp rise in the value of U.S. kraft linerboard exports—up 27.7% to a record $811.5 million," noted Irene Meister, API vice president-international.

U.S. linerboard producers again directed a greater portion of export shipments to Far East markets. Last year the Far East (including People's Rep. China) accounted for 40% of U.S. linerboard exports, up from less than 10% in 1977. Exports to western Europe declined to 26% in 1987 from 29.2% in 1986. This is down from 40% about ten years ago and more than 50% in the early 1970s.

The increase in U.S. export shipments last year matched total shipments by nine major supplying countries, which rose 5.4% to 4.67 million tons (see table).

European market strong. Western Europe linerboard demand remained strong in 1987, helped by an increase of approximately 6% in corrugated box shipments. Last year, western European imports from nine major supplying countries rose by 4.5% to 2.6 million short tons.

U.S. linerboard shipments to western Europe declined by 6.2% to 596,650 tons, their second-lowest level in the past dozen years. However, Nordic suppliers plus Brazil strengthened their position in the European market. Shipments from Sweden rose by 7.7% to 1.1 million tons and from Finland by 12.2% to 253,550 compared with 1986. Brazil increased its shipments to Europe by 19.5% to 186,270 tons. Shipments from Portugal, however, declined 15% to 121,180 tons. (The figures for western Europe do not include imports from France, South Africa, and the U.S.S.R., which in 1986 exceeded 270,000 tons).

Further testliner inroads? While final European linerboard consumption statistics are not yet available, Dr. Meister said it was possible to draw some preliminary conclusions based on the high level of corrugated box shipments and a stable inventory situation. "The testliner share of the linerboard market probably increased somewhat last year as local testliner producers continued to enjoy a competitive advantage because of extremely low wastepaper prices and rising prices for kraft linerboard due to the tight supply/demand situation," she noted.

Nordic shipments of bleached linerboard grades, mainly to western Europe, were strong. Sweden's total bleached exports jumped 15.9% to 197,800 tons, while Finland's rose 30.1% to 93,840 tons (reflecting rebuild of a machine to make white-top board). Finland continued to be the world's largest corrugating medium exporter, with total shipments of 345,270 tons in 1987, up 7.6%.

U.S. linerboard shipments to Japan of 167,000 tons remained unchanged from the previous year, while imports from Canada dropped 20% to 40,000 tons. Japanese production of domestic linerboard (including the wastepaper-containing grades) was strong—up 16% to 4.6 million tons, according to Japan Paper Assn. statistics.

Copies of the twenty-fourth edition of Exports of Kraft Linerboard and Corrugating Material from Major Supply Countries to World Markets are available for $100 ($105 foreign) from API's International Dept., 260 Madison Ave., New York, N.Y. 10016.

Kraft linerboard exports by major supplying countries to world markets (000 short tons).

	1987	1986	1985	% change 1987/86
U.S.	2,295	2,177	1,807	5.4%
Sweden	1,196	1,111	1,147	7.6
Canada	311	347	290	−10.4
Finland	284	244	262	16.4
Brazil	232	206	154	12.5
Portugal	126	149	151	−15.1
Austria	122	109	102	11.6
Norway	55	42	20	30.9
Spain	43	39	39	11.0
Total	4,666	4,425	3,972	5.4

Source: American Paper Institute—International Div.

Sulfite segments are up and down; chemicals cost more

A split exists among the sulfite-based pulp manufacturers as production falls for paper-grade chemical pulp but rises steadily for neutral sulfite semichemical (NSSC) and sulfur-free products. Chemicals supporting the processes are climbing despite the uneven production, as sustained demand and tighter supply for the major end-user markets continue through the close of this decade.

Sulfite pulping in the U.S. and Canada continues to decline, evident again during 1987 as two mills closed (Procter & Gamble, Ontario Paper) and others were completely dismantled. Thirty-four mills using the acid sulfite process remain, although their size and environmental vulnerabilities may dictate a few more closures during the 1990s. Many have made progress through modernization (e.g., switching mediums to accommodate chemical recovery, upgrading bleach plants to ease effluent loads, utilizing computers, and reaching and obtaining specialty grade market niches), and these mills should be strong. Capacity in North America stands at 9,000 tpd, and growth estimates are flat or negative.

Bisulfite mills are newer and more efficient. North America produces 3,300 tpd (of which the U.S. has two-thirds), and many larger locations are mainly integrated or adjacent to consumers.

Chemical suppliers for acid and bisulfite have treated the industry as a small player but have driven up prices along with the other industries who are experiencing the same economic boom. Elemental sulfur production rose less than 1%, as Frasch production fell sharply and recovered sulfur production jumped high enough to register an increase. Imports are growing and exports declining. This is a strong indication of the supply crunch across North America and the greater role to be played by the Saudis and Balkans. Sulfur dioxide shipments to the pulp industry increased but can be attributed to the demand for it in chemical pulp bleaching (as an antichlor and in chlorine dioxide generators). Liquids are the choice of many modern burners purchased by some Canadian mills, as bigger models and recovery loops work better with site-ready products and minimal makedown.

NSSC, sulfur-free, and green liquor processes are growing along with the indust[illegible]cycle. Semichemical board achiev[illegible] 5% increase in production last year, and it will probably reach 5.7 million tons in 1988. There is some new capacity, including expansions at Stone Container in Uncasville, Conn., and Corrugated Services in Forney, Texas, and restarts for Clinch River at Harriman, Tenn., ISC, CCA at Fernandina Beach, Fla., and Cascades at Niagara Falls, N.Y. Industry pundits are watching inventories of big-ticket items and nondefense durables as the key trend indicators.

PRICE. Chemicals used to produce these pulps have done well. Mills are still using traditional amounts of soda ash and sulfite compounds (6% to 8% and 10% to 14%, respectively) without other substitutes. Soda ash production will rise 10% over last year's level, and the forced price hike seen last year remains firm. Sulfur prices have recently been boosted, and producers and forecasters alike predict another upward move soon.

The price of caustic presents a double challenge to the industry. First, the tremendous consumption growth of sodium sulfite from the site-ready users and the new bleached chemi-thermomechanical pulp (BCTMP) mills have fueled demand and made utilization full. But caustic is used in processing, and its rising cost is now being transferred in part to the consumers. This same situation makes soda ash (and technologies to produce caustic on site) more attractive to all chemical pulpers, as each increase in caustic price gives new life to opportunities to switch to sodium carbonate products.

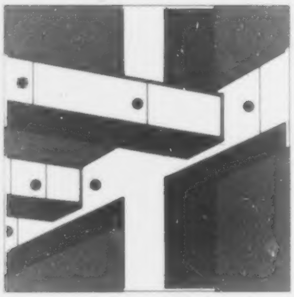
—*Michael Ducey*

Consumption rises and prices lag but follow trend.

Chemical	Pulp industry consumption, 1987 (short tons)	% change, 1987	Price[1]	% change, 1987
Sodium sulfite	134,00	16.7	$0.22/lb	10-15
Sodium carbonate	840,000	7.3	$80/ton	5
Sulfur[2]	56,800	3.2	$120/ton $94/ton	8

1. Prices courtesy of *Chemical Marketing Reporter.*
2. Sulfur prices are for southerna nd western freight on board shipments, respectively.

Correction. The July 1988 column on chemical pulp bleaching chemicals was in error. The information in the table should have read 4 billion pounds of chlorine consumed and 5.5 billion pounds of caustic consumed. The figures given represented the total production of each.



ENGINEERING: Assessment

ENGINEERS OPERATE AT FULL THROTTLE TO MEET INDUSTRY'S GROWTH DEMAND

With a record $11.5 billion in expansion money, and more seen for 1989, paper companies are taxing the ability of engineers to keep up

By KEN L. PATRICK, Editor in Chief

The North American paper industry has been on a spending spree for the past five years. Strong consumer demand has kept operating rates above 95% for many grades, and most companies have been churning unusually high profits back into their primary manufacturing operations. Currently, the volume of expansion/modernization work in the industry is taxing the ability of suppliers, particularly engineering firms, to keep up with demand. Equipment delays, rising costs, and a shortage of engineering manpower are becoming more common.

Since 1984, U.S. outlays for expansion/modernization projects have steadily increased, each year surprising analysts by setting yet another new record (Figure 1). At this time last September, capital spending in 1988 was expected to be 3% to 5% over 1987, somewhat of a turnaround from earlier projections (some were showing reduced spending). Certainly no one expected the 27% to 30% increase in capital spending that is currently being maintained. If estimations hold, the U.S. paper industry will spend some $11.5 billion by the end of this year.

The story is similar in Canada, where pulp and papermakers plan to spend a record C$3.23 billion on capital improvements this year, an increase of 31.8% over 1987. An additional $1.50 billion will go toward noncapitalized repair expenditures, 8.1% more than last year.

This pace of investment obviously is a reflection of the strength of the paper industry in North America, particularly in the U.S., where companies have prospered despite a recent loss of tax breaks, including the investment tax credit. Paper continues to outpace all other major U.S. industry segments in the size of its planned capital spending increase. U.S. manufacturers as a whole now plan to increase outlays by 12.1% in 1988.

The shortage and delay problems brought on by such a healthy expansion appetite, although certainly envied by many other industries—including the paper industry itself only a few years ago, could significantly restrain continued growth in the near future if they are not controlled. This issue of *Pulp & Paper* analyzes the current engineering "crunch" in detail, exploring some of the conditions that have caused it and examining various new approaches that could help lead to a more workable solution.

ENGINEERING CRUNCH. At a recent security analysts' meeting, Peter Norrie, senior vice president of Boise Cascade Corp., stated that "paper machine fabricators today will quote 26 to 28 months for delivery of a paper machine as opposed to 18 to 20 months a year ago." Equipment costs have also gone up 10% to 20% in the past year, according to Norrie. In addition, construction costs have been increasing in recent years, taking a sharp turn upward last year (Figure 2). Norrie pointed out that, making matters worse, there is currently a significant shortfall of engineers, especially at large engineering companies that serve the paper industry.

Norrie estimated that these firms now have approximately 4,500 engineers and that they would need another 1,500 to handle all of the work in house. "Capacity expansions under way today will likely come on according to schedule," he noted. But the projects scheduled to begin in a year may be delayed slightly, and startup dates for those projects slated to begin in two years may be set back as much as a year due to a combination of equipment delays and engineering/construction backlogs.

The industry's previous growth cycle was in the late 1970s to early 1980s. During this period, engineering and construction staffing was at an all-time high. Most firms report current staff levels approaching that previous peak, possibly surpassing it early next year. In fact, the real crunch, particularly on the construction side, is expected to occur sometime next year, with most firms now booked solid through 1989.

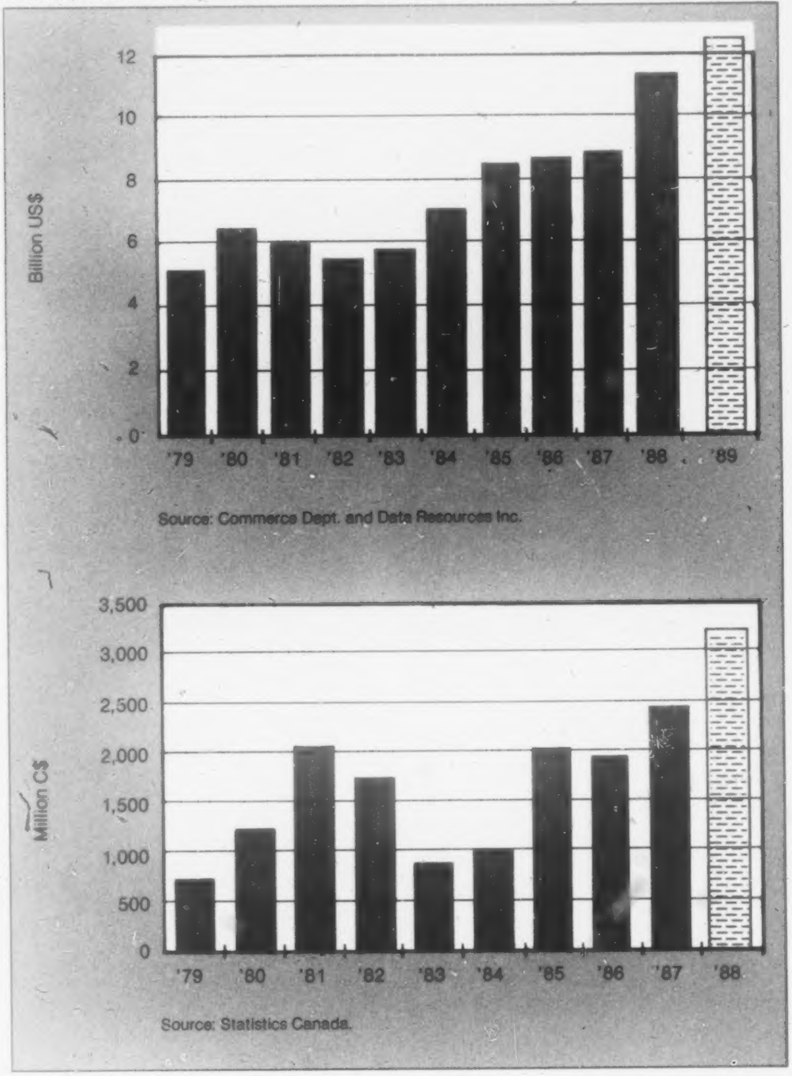
Fluor Daniel at Greenville, S.C., for example, currently has close to 30,000 construction personnel, not yet up to the approximate 40,000 that were employed during the 1979-81 heyday. But by the end of this year, it expects possibly to be up to that level. Prior to the 1979-81 boom, the company was averaging about 15,000 construction workers.

On the engineering design side, BE&K Engineering Co.'s backlog is at an all-time high. Officials there report the most activity since mid-1960. Ted C. Kennedy, BE&K's chairman, points to the fact that considerable engineering talent was lost after the industry's early 1980s downturn, complicating the current search for experienced, competent engineers.

Other engineering construction companies serving the pulp and paper industry, such as CRS Sirrine Inc., Rust International Corp., Simons-Eastern Inc., Sandwell Swan Wooster Inc., and Ford, Bacon & Davis Inc., also report full slates. Some are having to decline proposals or take only a share of major projects due to limited engineering capacity.

None of these companies is involved exclusively in the paper industry. Some 70% of Rust's engineering business, for example, is in pulp and paper, but Fluor

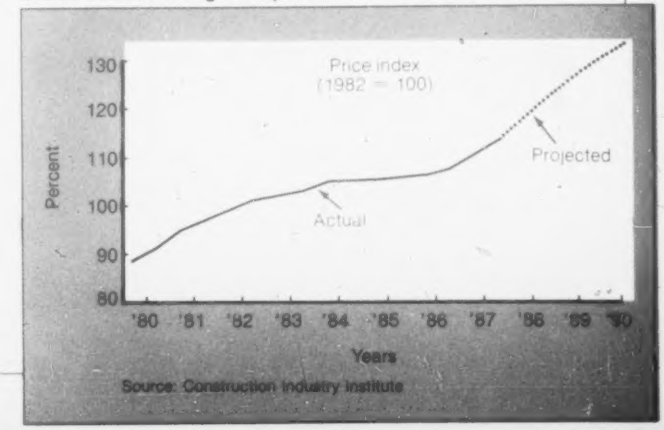
FIGURE 1: **U.S. and Canadian paper companies continue to set new capital spending records; even more is planned for 1989.**



Source: Commerce Dept. and Data Resources Inc.

Source: Statistics Canada.

FIGURE 2: **Construction costs in the U.S. have escalated in recent years, particularly since 1987, when the paper industry was in the middle of its current growth period.**



Source: Construction Industry Institute

TABLE [illegible] Major U.S. paper industry capital spending projects, 1989-91.

Company	Project	Cost	Startup
Blandin Paper Co. Grand Rapids, Minn.	New LWC paper machine, coater, TMP upgrade	$334 million	1989
Boise Cascade Corp. International Falls, Minn.	New paper machine, upgrade pulp mill, woodyard	$539.5 million	1990
Boise Cascade Corp. Rumford, Maine	New coal/biomass cogeneration plant	$187 million	1990
Bowater Southern Paper Co. Calhoun, Tenn.	Pulp mill expansion	$205 million	1990
Champion International Corp. Bucksport, Maine	Paper machine rebuild, new coaters	$63 million	1989
Champion International Corp. Pensacola, Fla.	Further rebuild of No. 3 machine	NA	1989
Champion International Corp. Quinnesec, Mich.	New paper machine	NA	1990
Chesapeake Corp. Menasha, Wis.	New tissue machine	$148.9 million	1990
Daishowa America Port Angeles, Wash.	Modernize two machines	NA	1990
Federal Paper Board Co. inc. Augusta, Ga.	New recovery boiler machine rebuild, pulp mill upgrade, others	$460 million	1988-91
Fort Howard Corp. Rincon, Ga.	Third tissue machine, new power boiler converting lines	$170 million	1989
Fraser Paper Ltd. Madawaska, Maine	Rebuild of two machines	$53.5 million	1989
Gaylord Container Corp. Bogalusa, La.	New linerboard machine, recovery boiler	$100 million	1990
Georgia-Pacific Corp. Woodland, Maine	New recovery boiler	$78 million	1989
Glatfelter Co. Spring Grove, Pa.	New cogeneration plant	$56 million	1989
Great Northern Nekoosa Corp. Ashdown, Ark.	New recovery boiler	$90 million	1989
Green Bay Packaging Inc. Green Bay, Wis.	Corrugating machine rebuild	NA	1990
Green Bay Packaging Green Bay, Wis.	New press section, pulp mill upgrade	NA	1990
International Paper Co. Vicksburg, Miss.	Upgrade linerboard machine, pulp mill	$50 million	1989
James River Corp. Camas, Wash.	Upgrade recovery boiler	$51 million	1990
Longview Fibre Co. Longvew, Wash.	New paper machine	$90 million	1990
Louisiana-Pacific Corp. Somoa, Calif.	Modernize pulp mill, bleach plant, recovery boiler, others	$102 million	1990
Newsprint South Grenada, Miss.	Greenfield newsprint mill	$320 million	1989
Ponderay Newsprint Usk, Wash.	Greenfield newsprint mill	$300 million	1989
Southeast Paper Mfg. Co. Dublin, Ga.	Second newsprint machine, new deinking and power plants	$300 million	1989
Stone Container Corp. Uncasville, Conn.	Paper machine, rebuild new generator	$24 million	1989
Temple-Inland Inc. Orange, Texas	Modernize two machines, recovery boiler, woodyard	$59 million	1989
Temple-Inland Inc. Rome, Ga.	Modernize two machines, new recovery boiler, mill upgrade	$170 million	1988-89
Union Camp Corp. Savannah, Ga.	New linerboard machine, major pulp mill upgrade	$375 million	1991
Westvaco Corp. Luke, Md.	Rebuild all five paper machines, new bleach line	$200 million	1990
Westvaco Corp. Wickliffe, Ky.	New coating facilities	$125 million	1990
Weyerhauser Paper Co. Columbus, Miss.	New pulp mill/bleach plant	NA	1990

Daniel is involved on a much smaller scale at 10% to 15% (although this amount is rapidly increasing). Somewhere in between would be companies such as CRS Sirrine at about 40%. The fact that these companies are additionally involved in other industries provides somewhat of a buffer against severe up and down cycles. Thus, experienced engineering staffs can be maintained to some degree if peak-and-valley projects are "cross-balanced." Many large consulting firms have been doing this as much as possible and plan to do so even more to prevent future engineering manpower crunches. A detailed discussion of the consulting firm's struggle to meet current industry demands begins on p. 76 of this issue.

Engineering firms are selectively acquiring experienced engineers from several sources, including other industries (petroleum, chemicals, textiles, etc.) as well as directly from the paper industry itself (mills, corporate and divisional engineering ranks, etc.). Although engineering expertise is transferable across industries to a certain degree, the engineer with specific pulp and paper process training and experience is particularly valuable at this time.

Thus, consulting firms are looking more at the industry itself as a supply house for potential employees, offering some very attractive salary and benefit incentives. In addition, an increasing number of engineering graduates from pulp and paper schools are accepting jobs with consulting firms as well as supplier companies, creating tremendous pressure on the schools to expand their programs and recruit more qualified students. However, this is not an objective that is easily accomplished. While most paper schools have stepped up their recruiting efforts, the number of students entering their programs has declined because of a combination of reasons, including not least of all a negative image of the paper industry. The current situation at U.S. pulp and paper schools is discussed in an article that begins on p. 210.

MAJOR INDUSTRY CAPITAL SPENDING PROJECTS. Table 1 lists most of the U.S. paper industry's major projects that are scheduled at this time for 1989-90. With engineering and construction companies already operating at or near capacity, this abundance of new projects obviously will serve to tighten the crunch beginning next year.

Not included in this list are the many projects that have come online or are scheduled to start up in 1988, including such major expansion projects as Georgia-Pacific Corp.'s new $100-million uncoated free-sheet machine at Zachary, La., James River Corp.'s new $88-million tissue machine at Clatskanie, Ore., and Potlatch Corp.'s new $75-million coated free-sheet machine at Cloquet, Minn.

The list does not include projects below approximately $20 million. Also not listed are major projects in Canada, such as Consolidated-Bathurst Inc.'s new $280-million groundwood specialties machine to start up in 1990 at Grand'Mère, Que., Finlay Forest Industries Ltd.'s $165-million project to integrate its Mackenzie, B.C., refiner-mechanical pulp (RMP) mill with a new 600-tpd newsprint machine (to start up early next year), and Great Lakes Forest Products Ltd.'s new 240,000-tpy newsprint machine at Thunder Bay, to cost some $217 million.

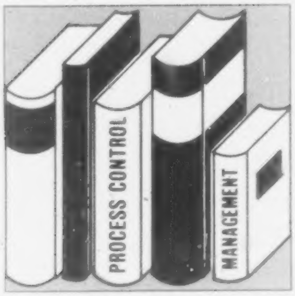
Table 2 shows major spenders in the U.S. This list includes companies with planned 1988 capital expenditures of $50 million and above. ■

TABLE 2: **U.S. capital spending by company, 1988-91.**

Boise Cascade Corp.	$794,000,000
Union Camp Corp.	$563,000,000
Federal Paper Board Co. Inc.	$498,000,000
Georgia-Pacific Corp.	$433,000,000
Fort Howard Paper Co.	$360,000,000
[illegible] Paper Co.	$344,000,000
Westvaco Corp.	$325,000,000
James River Corp.	$305,200,000
Southeast Paper Manufacturing Co.	$300,000,000
Mosinee Paper Corp.	$260,000,000
Temple-Inland Inc.	$242,975,000
Bowater Inc.	$205,000,000
[illegible] Paper Co.	$190,000,000
Great Northern Nekoosa Corp.	$182,100,000
Chesapeake Corp.	$148,900,000
Longview Fibre Co.	$147,000,000
Potlatch Corp.	$141,900,000
Champion International Corp.	$139,900,000
[illegible] Paper Co.	$138,200,000
Consolidated Papers Inc.	$183,100,000
Louisiana-Pacific Corp.	$102,000,000
Gaylord Container Corp.	$100,000,000
Jefferson Smurfit Corp.	$91,500,000
Stone Container Corp.	$83,706,000
Fraser Paper Ltd.	$73,600,000
Wausau Paper Mills Co.	$64,900,000
Glatfelter Co.	$58,000,000
Weyerhaeuser Paper Co.	$61,000,000

TABLE 3: **A consulting engineer's view of potential revenues and engineering manpower needed to handle paper industry capital projects through 1991. If 1989 (and beyond) spending is higher than figures shown, "engineers needed" would probably also be higher, extending the shortfall possibly through 1990.**

	Capital spending (billion $)	Potential consulting fees (billion $)	Engineers needed	Engineers available	Excess (+) shortage (−)
1986	8	360	4,500	4,500	0
1987	8.5	380	4,750	4,500	− 250
1988	11.25	510	6,400	4,750	−1,650
1989	10	450	5,600	5,000	− 600
1990	9.5	430	5,000	5,000	0
1991	9.5	430	4,750	5,000	+ 250



ENGINEERING: Staffing/Training

MEDIAN INCOME HITS $53,000 IN 1988, ACCORDING TO FOURTH SALARY SURVEY

P&P's May 1988 survey results show engineers gaining ground since 1984; top earners are still administrators, consultants, and salespeople

By **KELLY H. FERGUSON**, Projects Editor

This is *Pulp & Paper*'s fourth salary and opinion survey. Data from 1988 are compared with data from our 1984 survey to provide readers perspective on significant changes in compensation, benefits, and employee attitudes. The 1984 survey was selected because capital spending within the industry has been at record levels each year since that time.

The following report is based on responses to a questionnaire included in the May 1988 issue (*p.* 72). Information from the returned forms was processed by an independent data processing firm according to *Pulp & Paper*'s specifications. The number of responses were similar to previous years.

Basically, the report is designed to compare the progress of engineers in the paper industry, on the supplier and consulting side as well as in primary manufacturing, with professional peers in various other disciplines. In addition, the report also compares the salaries of specific engineering types and functions within the paper industry.

In general, the study indicates that engineers are gaining some ground in the compensation battle, a reflection of the increased value placed on engineering as capital expansion/modernization projects continue to stack up on drawing boards. Throughout this year, and particularly in 1989, the value of engineers is expected to increase even more as the "engineering crunch" continues to develop.

DATA ANALYSIS. The median income of respondents rose approximately 20% to $53,000 from 1984 to 1988, an average increase of some 4.7%/year. The median income of all respondents in 1984 was $44,000. Companies have grown, with 38.8% having annual sales of more than $2 billion in 1988, compared with 33.9% in 1984. Also, a majority (90%) said they liked their job, compared with 88.6% in 1984.

Similar to the profile in the 1984 survey, the average respondent is male (95.9%), lives in the Southeast (37%) or the Midwest (23.5%), works for a wood products/pulp and paper manufacturer (68%) in either production/mill operations (19.2%), technical service/quality control (13.7%), engineering design (13%), or engineering/maintenance (11.2%). Chemical engineers make up a larger percentage of bachelor degrees in the industry in 1988 (18.9%) than in 1984 (14.4%). Other degree distributions include: business (16.5%), paper science and technology (16%), and mechanical engineering (13.8%).

Job stability declined 4% during the four years, with 18% having changed employers in the last three years, compared with 12% in 1984. Other statistics include:

Compensation

- An average of two salary increases in the past three years
- The last pay increase was 6%
- Ten paid holidays and three weeks of vacation are taken yearly
- 92.6% receive annual salary reviews based on merit performance (56%), cost-of-living index (3.3%), or both (26.8%)

Reader opinions

Pulp & Paper's fourth salary survey asked readers for comments on any subjects related specifically to their jobs or companies and the industry in general. Opinions focused primarily on three areas—mergers/acquisitions and restructuring, problems with salary, and problems with management. Comments have not been edited for content (only grammar and style as necessary) in order to retain their originality. The following were selected as typical of the many responses received.

"Because of takeovers and cost-reduction programs, many employees have resurfaced as consultants. Companies are making wide use of consultants and paying as much or more by the job or assignment, but it doesn't show in the payroll as a direct cost or steady overhead. It is a one-time charge for each assignment."

—chemical engineer/Southeast

"The destructive effort to eliminate middle-level supervision has wiped out any opportunity for advancement among long-term technical people."

—engineer/Midwest

"My position may be eliminated with the restructuring."

—[illegible]/Southeast

"The new wave of restructuring in the industry is apparently aimed at eliminating middle management as unnecessary overhead."

—engineer/Southwest

"I have been employed in the paper industry for 30 years. It has been a rewarding and interesting career. I've been managing for 20 years. I now am in consulting. My pension is excellent and covered all my expenses."

—consultant/Northeast

"The uncertainty created by the current takeover/buyout craze is frustrating. It's kind of like musical chairs; you work, and you never know if it will happen to you."

—[illegible]/Southeast

"Although I would not like to work for any one company, my company has changed owners twice. I've had three different bosses in the last three years. But I've seen the company grow to be larger than any of the others."

—technical service representative/Southeast

"The paper industry is a healthy business, and contributes to a great extent to the economic viability of the U.S."

—salesman/Northeast

"I like the work, but it is difficult to work for a small, family-owned business."

—salesman/Midwest

"I have learned many good things at my present employer. However, the compensation for 60-hour work weeks 50% of the year and 50% travel do not balance the equation! Also, poor medical and dental programs and weak bonuses are a problem. Ah, but free toilet paper twice a week—that's what keeps me here!"

—electrical engineer/Midwest

"Salary is a major problem in the paper industry, especially where high growth in the last two years has not translated to higher raises for employees."

—salesman/Southeast

"Salaried professionals are underpaid in the paper industry compared with the union labor force."

—mechanical engineer/Southeast

"I [am employed by] a process control company that sells to the pulp and paper industry. I am changing jobs to work in a mill for a customer because it pays far more."

—engineer/Northeast

"I love the business and hope to stay with it until retirement."

—administrator/Southeast

"For the job I perform, I am definitely underpaid."

—market pulp purchaser/Southeast

"Lincoln was supposed to have freed the slaves. Southern companies are the cheapest to work for."

—production supervisor/Midwest

"The new team concept does work and is more compensating for the lower number of employees."

—production worker/Midwest

"I'm at a level of shift superintendent and am satisfied with my position. I've lived here for 36 years and have seen too many upper-management people move in and out. I don't ever want to have to relocate."

—production supervisor/Southwest

"Growth and salary for line supervision in the paper industry need to be brought up to that of other industries."

—maintenance supervisor/West

"Senior management does not understand papermaking and lacks a clear strategy."

—mechanical engineer/Midwest

"Employee cost sharing of medical insurance is costing me $1,000 a year vs only a $1,700 increase for my last raise—effectively only a 1.7% raise."

—civil engineer/Southeast

"Federal government employees work as hard, if not harder, than their industry counterparts but don't receive the same credit or compensation."

—consultant/Northeast

"I feel my company discriminates against women."

—production worker/Southeast

"Environmental issues must be faced more realistically, instead of reacting to governmental pushing."

—construction engineer/Southeast

"Short-term MBA attitude at corporate management level makes mill-level decisions very difficult. It's always changing, with no commitment to long-term planning."

—project engineer/Northeast

"My company has a policy of hiring for promotions from outside company ranks. This is demoralizing to employees."

—engineer/Southeast

"I have found it's not what you know, but who. Sad. Very sad."

—production worker/Northeast

"Many corporations are not making the effort, or are expending insufficient effort, to keep their technical people technologically current, and they do not provide the time or means to continue education. In addition, they are not laying down career paths with those individuals."

—technical service supervisor/Midwest

"Corporations are not developing young talent. There doesn't seem to be much interest in career planning."

—chemical engineer/Northeast

"Engineering and maintenance are being neglected by the new and young management. It is going downhill fast."

—mechanical engineer/Northwest

"My company is in a transition period, trying to change from an autocratic management style to a more progressive, employee-involvement style. Many managers, particularly my mill manager, are struggling with this new concept. We are a small mill run by one man—the mill manager. He insists people do what he wants, not what the other managers think—no team approach or concept."

—production worker/Northeast

"Morale at our facility is generally low due to upper-management decisions. The policies are very unclear, and very little technical evolution on an equal basis is carried out due to incompetent managers."

—researcher/Canada

"I was laid off in 1986 due to the present 'fad' of mergers. It took me one and a half years to secure a job again with the pulp and paper industry."

—timberland worker/Midwest

"My company does not take advantage of employee experience—it often makes foolish, expensive, avoidable mistakes. It is very insensitive to salaried employees."

—production worker/Northwest

"The majority of people working in this industry live in rural/remote areas, which brings down average salaries and [also] seriously affects the attitudes of managers in urban areas. I would like to change industries for this reason."

—project manager/Northeast

"Industry is leaning to accountants in upper-management jobs. I think technical personnel should have some of those positions."

—mechanical engineer/Southeast

"I would leave tomorrow if I found something interesting."

—maintenance supervisor/Northeast

- 87.6% are not paid overtime
- The average respondent has not had a promotion in the last three years.

Personal

- 99.6% of the respondents work full-time; 2% are self-employed

FIGURE 1: **Income and professional experience.**

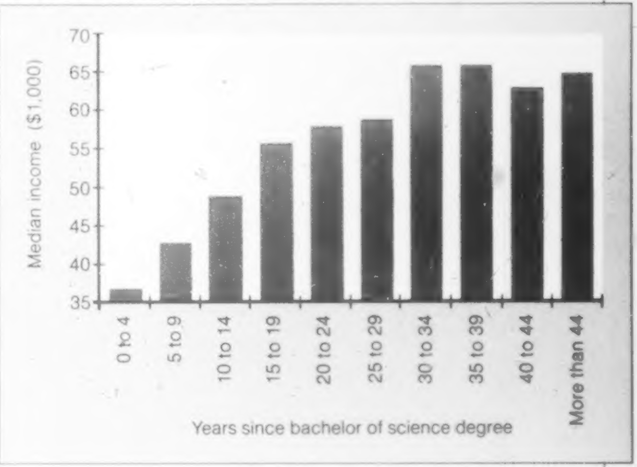


FIGURE 2: **Income and number of years with current employer, all respondents.**

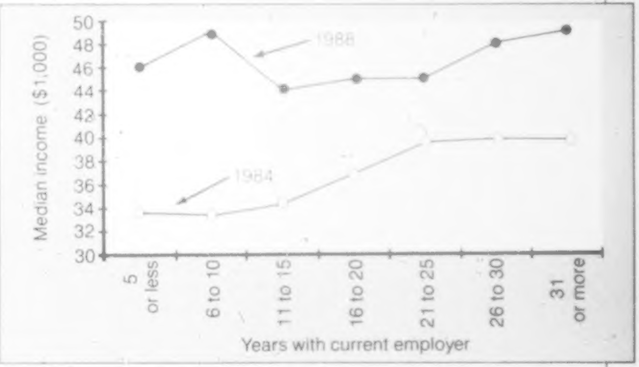
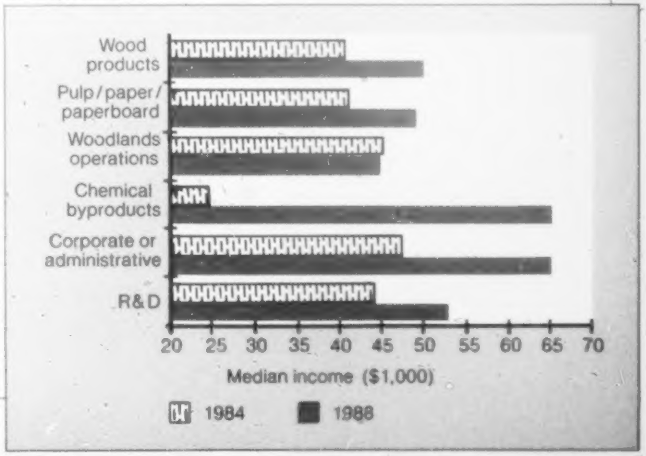


FIGURE 3: **Income and type of wood/pulp/paper company, all respondents.**



- Respondents work an hour more in 1988 (46) than they did in 1984 (45)
- 50.6% are more than 40 years of age, compared with 47.8% in 1984.
- The average respondent's work experience since leaving school is between 10 and 14 years
- 64.6% manage at least a team or unit
- 58.5% have bachelor's degrees
- 27.1% have advanced degrees
- The average respondent has been with his or her present employer 11 years and has changed employers only once
- 38.1% came from another industry

Morale

- On a scale of 1 (bad) to 5 (good). 61.4% ranked their job morale as above average (4)
- 90% say they like their job
- 86.8% say they would stay in the paper industry if they changed jobs

FIGURE 4: **Income and number of employees managed, all respondents.**

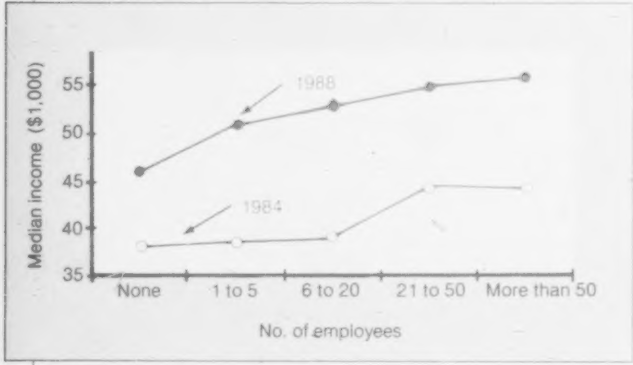


FIGURE 5: **Income and number of years of management experience, all respondents.**

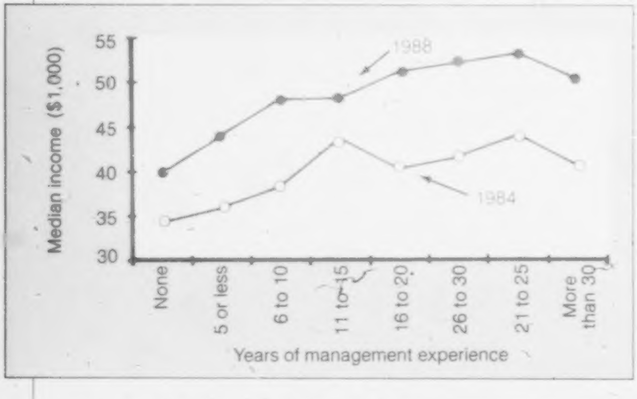


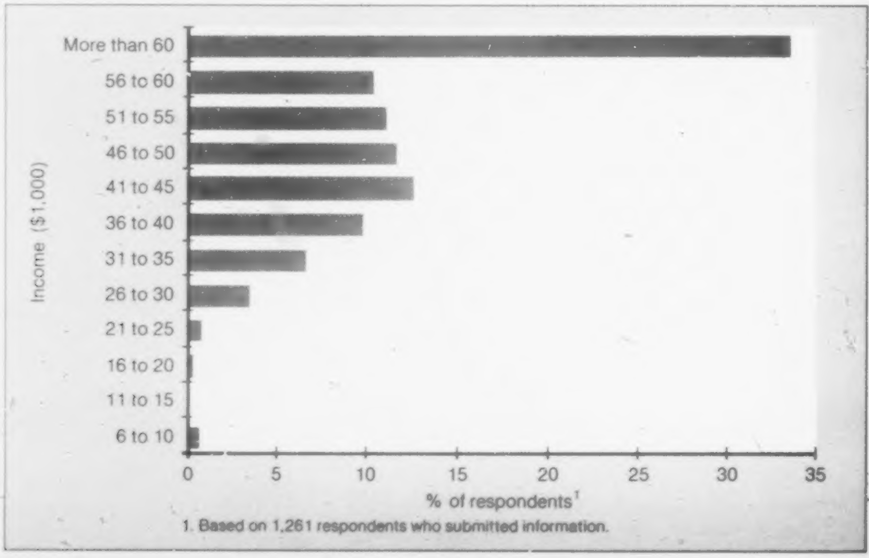
TABLE 1: **Salary distribution of all respondents.**

	Salary ($1,000)		
	1988	**1984**	**% change 1984-88**
Lower decile	35	30	16
Lower quartile	42	36	16
Median	53	44	20
Upper quartile	66	55	20
Upper decile	85	70	21

TABLE 2: **Benefits of respondents.**

	% of respondents	
Benefit	**1988**	**1984**
Medical insurance	92.8	92.7
Life insurance	89.6	91.3
Profit sharing	37.1	57.9
Retirement pension plan	83.8	86.1
Company car	12.2	41.1
Bonus plan	31.8	36.9
Stock option plan	39.5	34.9
Dental insurance	78.5	47.0
Travel budget	24.7	16.5
Education allowance	47.2	27.0

FIGURE 6: **Income distribution of respondents.**



1. Based on 1,261 respondents who submitted information.

- 84.8% say their company listens to their input and values their experience.

ANALYZING THE RESULTS. Tables 1 through 10 and Figures 1 through 5 present survey findings on compensation compared with a number of variables, including degree, discipline, work type and experience, size and type of employing organization, and supervisory level. Income figures reported in all tables were obtained by adding any bonuses or additional income reported by respondents to their reported gross salaries.

The profile of our average 1988 survey respondent is very similar to that of 1984's survey. The 20% increase in median salary (Table 1) over the four years seems to reflect steady growth in the industry.

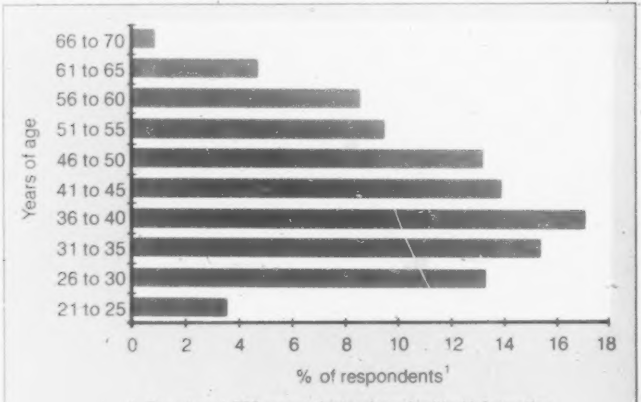
Table 2 shows a 20.8% decrease between 1984 and 1988 in the number who take part in company profit-sharing plans and a 28.9% reduction in the number who use company cars. But respondents who receive dental insurance increased 31.5%, and those who receive an education allowance increased 20.2%. More employees are traveling, or the cost of travel has increased, as evidenced by an 8.2% increase in travel budgets.

Table 3, comparing income and type of employment organization, shows self-employed consultants have a $70,000 median income. Respondents who work at consulting firms and wood products and pulp and paper supplier companies tied with a median income of $60,000.

A comparison of principal work function with median income (Table 4) shows that the highest median salary ($69,000) belongs to those in administration. Salaries of consultants ($64,000) inched closer to administration salaries. The largest percentage increase in salaries during the four years occurred with those working in product development—going from $38,000 in 1984 to $56,000 in 1988, an increase of 47%. Salaries in teaching/academics made a 41% jump.

No clear trend can be seen in Table 5, which relates size of the employing organization with median income, except that those respondents who do not know the amount of their companies' annual sales have a consid-

FIGURE 7: **Age distribution of respondents.**



1. Based on 1,290 respondents who submitted information.

TABLE 3: **Income and type of employment organization, all respondents.**

	Income ($1,000)					
Employing organization	**Lower decile**	**Lower quartile**	**Median**	**Upper quartile**	**Upper decile**	**% change in median 1984-88**
Academic	33	33	55	62	63	22
Government	31	31	31	31	31	0
Wood/pulp/paper—engineering	37	44	56	68	80	24
Wood/pulp/paper—manufacturing	34	41	50	64	82	13
Consulting firm	40	50	60	70	80	17
Self-employed consultant	55	65	70	100	100	16
Wood/pulp/paper—supplier	38	47	60	75	95	33
Wood/pulp/paper—converter	28	40	53	83	108	26
Other	30	45	56	70	82	24

TABLE 4: **Income and principal work function, all respondents.**

	Income ($1,000)					
Principal function	**Lower decile**	**Lower quartile**	**Median**	**Upper quartile**	**Upper decial**	**% change in median 1984-88**
Administration	40	50	69	95	135	18
R&D	32	38	47	63	81	4
Consulting	51	57	64	72	80	27
Engineering design	38	44	54	63	78	25
Teaching/academic	55	55	55	62	62	41
Product development	40	47	56	66	71	47
Production and mill/plant oper.	36	43	52	67	85	15
Engineering/maintenance	35	42	51	59	72	27
Sales and marketing	33	45	58	68	91	18
Technical service/quality control	31	37	44	53	65	12
Other	28	39	51	70	89	27

erably lower median income than those who do know.

As would be expected, the highest median income ($95,000) was reported by those at the corporate management supervisory level. As in 1984, the median income of all respondents corresponds directly to their level of supervisory responsibility (Table 6).

Figure 1 shows that median income increases with years of professional experience through 34 years. After that point, the correlation is not as clear and seems to confirm the problem of salary compression.

As in 1984, Table 7 may present misleading data comparing income and educational field. Business and forestry/agriculture majors claimed the highest median income ($57,000). Five groups tied for second with $56,000 in median income. However, each group represented only a small number of respondents, making the data difficult to analyze statistically.

Table 10 shows that job hopping seems to pay off, with a steady increase in median income as the number of employers increases. Those with six or more employers reported making $60,000, compared with an income of $46,000 for those who have had only one employer.

Job stability (or perserverence/experience) does pay, according to Figure 2. However, some of the data may be unreliable, as shown by the peak of respondents from six to ten years, followed by a drop and then a slow rise.

The editors of *Pulp & Paper* hope this survey will be useful to our readers. Comments on how it can be improved or comments on the magazine in general are always appreciated and should be addressed to: Projects Editor, *Pulp & Paper*, 2700 Cumberland Parkway N.W., Suite 530, Atlanta, Ga. 30339. ■

TABLE 5: **Income and size of employing organization, all respondents.**

Organization's annual sales (million $)	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile	% change in median 1984-88
Less than 100	33	42	55	68	100	25
100 to 49	30	40	52	65	81	13
500 to 999	33	43	53	66	85	17
1,000 to 2,000	36	42	53	68	85	15
More than 2,000	37	44	55	68	86	25
Do not know	31	36	44	56	62	15

TABLE 6: **Income and level of supervisory responsibility, all respondents.**

Supervisor responsibility	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile	% change in median 1984-88
None	31	36	44	54	66	22
Indirect or staff	31	38	46	57	66	17
Team or unit	35	41	49	58	68	16
Project or section	36	46	53	64	75	17
Major department or division management	42	52	66	80	101	22
Corporate management of organization	53	70	95	122	250	35

TABLE 7: **Income and educational field—bachelor's degree only, all respondents.**

Discipline	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile	% change in median 1984-88
Forestry/agriculture	30	42	57	75	89	16
Chemistry	37	45	54	64	80	12
Mechanical engineering	39	46	56	69	82	27
Chemical engineering	37	43	53	66	82	15
Civil engineering	40	43	56	68	87	24
Electrical engineering	40	49	56	65	80	16
Industrial engineering	28	42	51	55	65	15
Mathematics/physics	32	33	50	70	77	8
Computer science	0	0	0	0	0	-100
Biology/life science	26	31	38	48	65	8
Paper science and technical	35	39	49	61	85	19
Environmental science	36	46	56	70	77	47
Business	37	46	57	72	100	16
Liberal arts	29	35	53	65	96	5
Other	34	41	56	71	95	27

TABLE 8: **Income, professional experience, and educational level, all respondents.**

Years since bachelor of science degree	Highest degree	Income ($1,000) Lower decile	Lower quartile	Median	Upper quartile	Upper decile	% change in median 1984-88
0 to 4	B.S.	30	35	37	39	42	0
	M.S.	40	40	43	45	45	30
	Ph.D.	41	34	35	49	49	-5
5 to 9	B.S.	30	36	44	51	53	0
	M.S.	45	49	54	61	62	7
	Ph.D.	34	44	49	57	62	-14
10 to 14	B.S.	34	43	52	60	68	-7
	M.S.	48	58	65	72	80	27
	Ph.D.	39	40	53	67	80	-22
15 to 19	B.S.	43	48	55	66	87	9
	M.S.	58	60	67	80	93	0
	Ph.D.	42	54	70	89	117	66
20 to 24	B.S.	43	51	65	72	74	32
	M.S.	45	56	70	90	101	40
	Ph.D.	49	51	57	63	80	-1
25 to 29	B.S.	47	59	81	95	107	55
	M.S.	53	53	80	80	107	35
	Ph.D.	51	54	60	65	105	0
30 to 34	B.S.	53	56	68	78	78	3
	M.S.	72	72	93	93	160	0
	Ph.D.	54	54	60	80	91	0
35 to 39	B.S.	10	60	65	80	90	71
	M.S.	56	56	58	77	108	45
	Ph.D.	68	68	112	112	426	166
40 to 44	B.S.	74	74	74	116	116	42
	M.S.	0	0	0	0	0	100
	Ph.D.	0	0	0	0	0	-100
More than 44	B.S.	80	80	80	80	80	42
	M.S.	0	0	0	0	0	-100
	Ph.D.	0	0	0	0	0	0

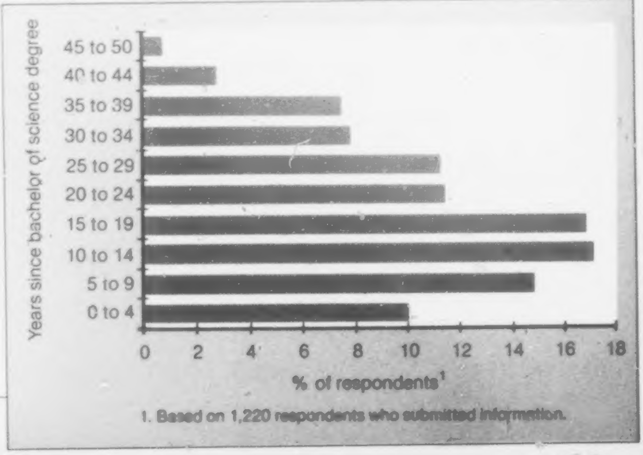
TABLE 9: **Income, professional experience, and educational field—bachelor's degree only, all respondents.**

Years since bachelor of science degree	Income ($1,000) Forestry/ agriculture	Chemistry	Mechanical engineering	Chemical engineering	Civil engineering
0 to 4	0	41	35	38	37
5 to 9	28	44	41	45	41
10 to 14	42	45	50	50	43
15 to 19	57	54	57	57	56
20 to 24	0	63	58	63	88
25 to 29	70	53	66	69	59
30 to 34	60	68	68	61	75
35 to 39	51	48	70	78	70
40 to 44	0	75	80	70	56
More than 44	0	0	65	80	0

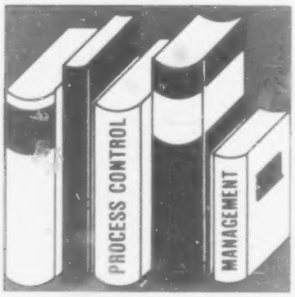
TABLE 10: **Income and number of full-time employers, all respondents.**

Employers	Income ($1,000) Median	% change in median 1984-88	Respondents
1	46	15	361
2	53	20	369
3	56	19	207
4	57	16	126
5	58	16	86
6 or more	60	22	43

FIGURE 8: **Years of experience distribution of respondents.**



[1] Based on 1,220 respondents who submitted information.



ENGINEERING: Staffing/Training

U.S. PAPER SCHOOLS STRUGGLE TO MEET THE INDUSTRY'S DEMAND FOR ENGINEERS

Changing demographics and more popular fields have left schools short on students at a time when companies need more engineers

By **KELLY H. FERGUSON**, Projects Editor

Asked if their institutions are keeping up with industry demands, U.S. paper school officials will likely answer "No." The need for qualified engineers is at an all-time high in the North American paper industry due to record level capital spending and a growing backlog of mill projects, from standard performance upgrades to major greenfield expansions. Engineers with paper technology backgrounds are scarce, to say the least, and most engineering firms are finding them wherever they can.

But being able to offer good jobs to graduate engineers is not enough to attract qualified students to paper schools. In fact, job offers have never really been a problem, even in some of the industry's worst down cycles. Today, paper schools are facing other, less objective enrollment problems that could threaten the future supply of specialized engineers in the paper industry.

The number of students going to college has dropped overall, and interest in business-related fields is heavy. This has caused a decline in enrollment at paper schools, and some officials say that this decline may continue for some time.

Past surveys have shown the paper industry getting 10% to 20% of its technical work force each year from pulp and paper schools. Most of these schools have watched their programs decline; others have not yet seen a decline. Their reactions range from boosting recruitment to almost ignoring the manpower shortage and maintaining a steady program. Several factors affect their philosophies for dealing with the decline, including school size, geographic location, and past placement performance.

At some schools, the number of scholarships and their amounts have been increased to attract talent. Most schools, in recruiting top high school students, tell prospects of high starting salaries and an abundance of jobs in an industry running at almost full capacity.

But some school officials say trying to meet the immediate needs of an employee-hungry industry by recruiting heavily could lead to dumping once the good times disappear. A few said they saw no damaging effect from attempts to boost enrollment, but at the same time they said they would not increase recruitment until it was warranted.

DECLINING ENROLLMENT. Of the seven schools surveyed by *Pulp & Paper*, four reported a decline in program enrollment in the past few years. Three schools said their programs had been static or had fluctuated only slightly.

North Carolina State Univ.'s Dean Eric Ellwood, in an address to the school's pulp and paper foundation, stated that "the forestry schools of the nation have suffered a 47% reduction in enrollment; however, the pulp and paper curriculum has suffered only a 20% drop since 1979."

At the base of the decline is the aging of the U.S. population. "Our enrollment has dropped, and the drop has mirrored the demographic data—the availability of college-age people," said James Bambacht, a professor in the College of Environmental Science & Forestry at the State Univ. of New York.

David Kraske, Univ. of Maine at Orono's department chairman for chemical engineering, pointed out that "the baby boom engineers are graduated, and the industry is facing a 10- to 15-year drought, possibly longer." Maine has experienced a slight enrollment reduction.

The declining number of qualified, college-age students means a fight among industries to attract those students. This is a fight, some school officials say, that the pulp and paper industry must join.

"Students are going to computer science, electrical engineering, and business. That is where the enrollment in the universities is now," said Richard Thomas, wood and paper science department chairman at N.C. State. Dr. Thomas said the university has experienced an enrollment decline and has been recruiting vigorously to overcome it.

Miami Univ. had been experiencing an enrollment decline, according to R.C. Peterson, executive director of the Miami Pulp & Paper Foundation. Peterson pointed to strong recruiting as the reason for its jump from 25 freshmen last year to 38 enrolling for the coming academic year. Western Michigan Univ. at Kalamazoo also experienced a decline.

Two schools, the Univ. of Wisconsin at Stevens Point and the Univ. of Washington, have had no decline. Wisconsin's Larry Graham, department chairman of paper engineering and science, said, "A few years ago, our incoming freshmen enrollment declined from about 85 or 90 to about 70, but that was more a reflection of increased enrollment standards at the university. We've remained at about 70 freshmen since then."

RECRUITING STUDENTS. Donald F. Root, executive director of Washington's Pulp & Paper Foundation, said the school has seen no decline in enrollment, but he points to Washington's smaller program and the area from which it draws students. "We've found it easy to meet our enrollment targets without a very aggressive recruiting effort. If we recruited more vigorously, we'd be overwhelmed by applicants."

Wisconsin is another school that has not felt the need to increase recruiting. "We've been able to fill our need for students with a fairly minimal effort," Dr. Graham said. "We are lucky geographically because we have potential students who are aware of the industry and aware of the opportunities."

David Peterson, associate professor at Western Michigan, said it has made no specific efforts to bring more students to the school, but it has begun distributing a videotape to launch a recruiting effort.

Maine uses seminars aimed at high school students along with recruiter visits to push its program. Kraske said, though, that the industry may be relying too heavily on schools. "The industry is allowing academia to do the recruiting and is not promoting its own interests. The industry must become much more active in reaching candidates for universities and getting them interested in engineering."

N.C. State has the largest recruiting area of the schools surveyed, visiting about 32 cities from North Carolina to East Texas. Dr. Thomas said most of the school's recruiting is in cooperation with industry. "We go to mill sites and talk to students the companies bring in." The school also conducted a recruitment training seminar in August with representatives from 15 mills from around the country.

"Students, generally, will go where the money and the jobs are, and that's the message that needs to be sent to high school students," Dr. Thomas said. "Year after year, we're among the highest starting salaries on this campus. That's the kind of information that needs to get out."

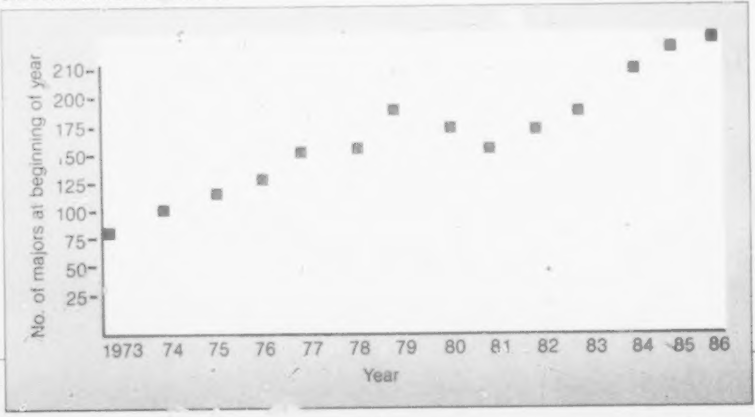
"BUYING" STUDENTS. The paper industry is not popular with high school students (see sidebar). More than ever, students are looking for glamour and a way to pay their tuition bills when they make career deci-

TABLE 1: **Enrollment trends at N.C. State Univ.'s Dept. of Wood & Paper Science from 1978 to 1988.**

Year	Freshmen enrollment	Undergraduate enrollment	Degrees granted
1978	44	147	26
1979	68	173	27
1980	65	190	25
1981	77	195	34
1982	62	188	26
1983	58	189	39
1984	51	178	21
1985	44	159	29
1986	53	158	30
1987	39	142	17
1988[1]	39	150	—

1. 1988 figures are estimated.

FIGURE 1: **Enrollment trends from 1973 to 1986 for the Paper Science & Engineering Dept. at the Univ. of Wisconsin, Stevens Point, one of only a few schools whose enrollment has increased.**



sions. Therefore, recruiters are just window shopping for talent unless they can offer financial incentives—namely scholarships.

"It's the resources that are needed—the dollars to provide scholarships—because schools have to 'buy' the talent. They won't get it any other way." Dr. Thomas said. "We buy a lot of students. At N.C. State, a student can earn a degree in pulp and paper in eight semesters and, by staying another semester, can earn a degree in chemical engineering. So we are able to buy chemical engineering students."

As part of its recruiting drive, Miami's Pulp & Paper

The invisible industry

The paper industry has an image problem. In reality, most people know little or nothing about its varied products, much less its complex processes. Unlike the petroleum industry, for example, it has no real or glamorized tycoons—no Ewings, Gettys, Pickens, Iacoccas, etc. We have no paper magnates, no pulp sheiks, and no paper cartels to grab the attention of the international media.

Most likely, the public as a whole associates the paper industry with small towns, bad odors, and lingering labor problems. Certainly, it is not seen as a "trendy" business with many glamour trappings to attract today's image-conscious students. But possibly as bad, it may not have much of an image at all.

Recruiting bright, high-performance high school graduates for careers in papermaking is not an easy task today, considering the allure of other, more glamorous professions. With the current shortage of engineers to handle a backlog of expansion/modernization projects that is expected to grow even larger next year, this could become a major problem.

North Carolina State Univ.'s "Pulp & Paper Foundation 1987 Annual Report" commented on image in the student recruitment committee report, written by Robert C. Harrison. "Heavy competition in a shrinking market is further complicated by what remains a continuing poor industrial image of the pulp and paper industry vs the surging reputation of 'glamour' career patterns in investment banking, high technology, computers, etc."

"Paper is such a common commodity. It's one of those things that you take for granted," said Western Michigan Univ.'s David Peterson. "We have not had a shortage, so it is taken for granted. When you look at what paper is, it looks simple and not particularly interesting."

N.C. State's Richard Thomas said, "The pulp and paper industry basically has no image. I've had mothers and fathers of students who have accepted scholarships ask me 'Well, what is pulp and paper?' "

"A lot of people don't even know about the pulp and paper industry," said R.C. Peterson of Miami Univ. "That's the biggest problem. Pulp and paper companies don't advertise on networks about the importance of the paper industry on the economy. I would say there's not an image problem; there just is no image. The industry is what many people call 'the invisible industry.' "

But some say the pulp and paper industry has an image—a bad image. Environmentalists' accusations, pollution problems, and labor confrontations have often put pulp and paper companies in the media spotlight.

"The pulp and paper business is at a disadvantage," said David Kraske of the Univ. of Maine at Orono. "Take Maine, for example, and look at the labor relations climate that has been associated with the pulp and paper industry here. Add to that the volume polluter in Maine is still the pulp and paper industry. Add that to the picture of the industry as a whole. Some people regard that not as opportunity but as real a image buster. Pulp and paper is not a glamour industry."

Some companies do advertise in the print media, but normally those advertisements are aimed at the business community. Miami's Peterson noted, "While companies make pitches for the public to buy stock, they aren't pitching to the young people."

Is there a solution? Even when the industry is doing well, little is mentioned in the press about it.

"I think all the negative things that are in the media relative to American industrial competitiveness have not highlighted the pulp and paper industry in what, I think, is the only smokestack industry in the U.S. that is truly internationally competitive, at least in some areas," said Peterson.

"When you begin to look at the varieties of paper, the way it is used, and the varieties you make from a single source of fiber, paper begins to be more interesting," said Western Michigan's Dr. Peterson. "Our objective is to get young people to look at the challenges that are in the industry, and then I think we can turn a lot of people on to it."

N.C. State's recruitment committee will "spend considerable time describing the fundamentals of the pulp and paper industry, summer employment, starting salaries, professional opportunities within the industry, as well as the actual track record of our alumni," according to Harrison's report.

"In addition, we are revising our brochure to reflect this emphasis as well as collecting considerable public relations information from our primary member companies in order to help neutralize and remove any negative image our industry might have in the eyes of a high school candidate and his or her parents," Harrison wrote.

But one area where the industry image is not so tarnished or lacking is the mill town. Most pulp and paper schools reinforce that positive image with heavy recruitment in a place they know will give them support.

According to Kraske, "The paper industry suffers from an image problem, and they've got to work to defeat [it]. They can do that by educating the people who live in mill towns. They do that already, to some degree. We wind up here with students who are interested in the paper business because their parents have been in the paper business."

Foundation voted to provide more freshman scholarships and add a "premium scholarship" aimed at the very top students, Peterson said.

Other schools, like Syracuse, said that they have not raised scholarships because they have always had generous policies.

Kraske, in reference to his forecast of a student drought, said that "maybe the industry should think about subsidizing an engineering education—accepting a base-level engineer then funding his or her schooling for another year."

REACTION OR OVERREACTION. Heavy recruiting at a time when the industry is at a peak risks the possibility of too many graduates and not enough jobs when a downturn occurs.

"I think there is a potential problem," Kraske emphasized. "Right now we're experiencing very good times, but the cycle will eventually swing the other way. When the downturn happens, and we have increased enrollment, we could have a disastrous placement year.

"If you try to build student enrollment during the peaks, it's going to create problems in the valleys. To keep a good level of entering students, schools must make sure students are being placed. It doesn't take long for information about poor placement to get down to the high schools. Our key attraction is good placement."

Syracuse's Dr. Bambacht agrees: "One of the things we have to avoid is overreacting to a crisis situation. The supply of engineers is a cyclic thing, and the current problem will probably solve itself."

N.C. State's Dr. Thomas said he sees recruitment as an industry-driven need for workers that has always existed. "I can recall only two years in the 30 years I've been here that we have not had 100% placement. And by 100% placement, I mean placement at, or even before, the time of graduation."

Other school officials also report excellent placement records. At Western Michigan, "We've had 100% placement since our program started in the late 1940s. Some of our students will have jobs before they graduate. Usually they'll have several to choose from. In the worst times, they've had one or two," said Dr. Peterson.

At Washington, "I still sense a very strong market for our graduates. Even during the prolonged period in the first half of the 1980s, we placed our graduates," Root said.

According to Dr. Thomas, "When times are good, everybody gets hired. When times tighten up, only the best get hired. We tell that to students."

TABLE 2: **Miami Univ.'s Dept. of Paper Science & Engineering enrollment figures for fall term 1977 to 1987.**

Year	Freshmen	Sophomores	Juniors	Seniors	Fifth-year students	Graduate students	Total	New students
1977-78	58	45	49	34	2	12	200	84
1978-79	60	44	39	49	9	15	216	77
1979-80	55	41	43	47	2	26	214	75
1980-81	52	50	36	42	10	24	214	85
1981-82	39	40	44	35	10	28	196	55
1982-83	50	37	34	44	10	30	205	72
1983-84	31	36	30	36	14	24	171	58
1984-85	35	19	35	28	18	19	154	45
1985-86	34	30	15	33	16	17	145	47
1986-87	25	26	28	16	23	14	132	46
1987-88	26	23	22	26	13	19	129	41

TABLE 3: **Undergraduate enrollment by class from 1982 to 1986 for Western Michigan Univ.'s Dept. of Paper & Printing Science & Engineering.**

	1982	1983	1984	1985	1986
Freshmen	52	52	47	29	18
Sophomores	29	46	36	39	20
Juniors	39	22	41	22	35
Seniors	55	55	42	44	36
Others	5	2	3	1	0
Total	**180**	**177**	**169**	**135**	**109**

WHERE THE GRADUATES GO. No longer are these young engineers going straight to the pulp and paper companies. Many companies are reducing their engineering staffs and using support companies and consultants instead.

Miami's Pulp & Paper Foundation, in its 1987 annual report, stated that a survey of 74 alumni graduated since 1984 showed "a marked increase in the number of graduates whose first position was with an engineering or equipment company."

The chairman of Miami's Paper Science & Engineering Dept., William E. Scott, wrote in the annual report that "placement was excellent, with all students who sought jobs finding them. Of the 30 students who graduated, 15 took positions with paper companies, 13 went with suppliers, and two elected to continue in graduate school."

Washington's Root also noted the trend. "There is not so much an enhanced demand from the primary producers but from the suppliers—engineering companies, consulting companies, machine suppliers, and chemical suppliers. Also, considerable restructuring is going on. The industry is reducing the layers of employees.

"I think we're experiencing a temporary phenomenon caused mainly by a tremendous surge in capital investment. Companies can't get enough engineers to carry out essential projects. And some companies aren't taking on any new business because of that." ■

PULP & PAPER

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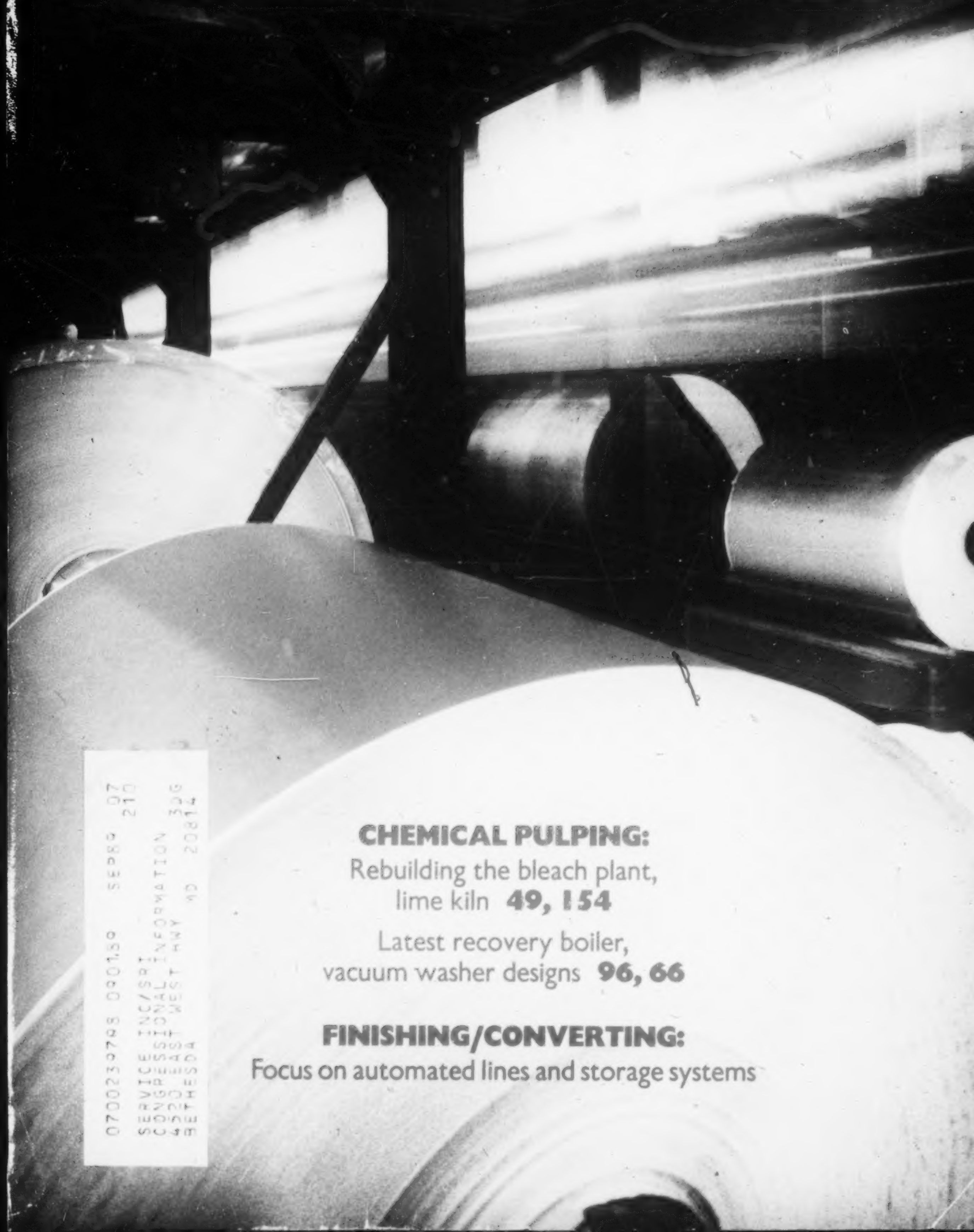

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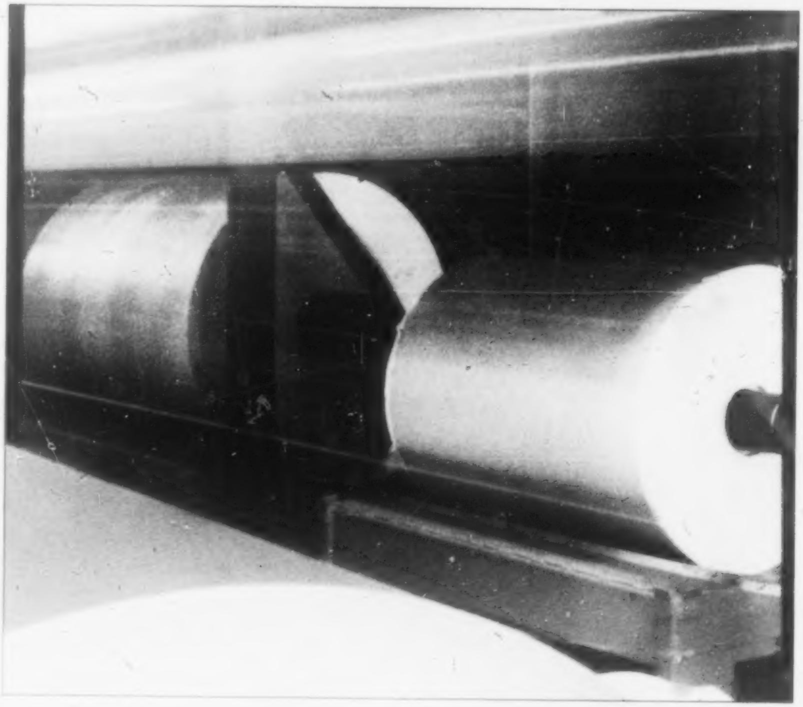

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This issue's focus on Finishing/ Converting includes a detailed feature on Appleton Papers' fully automatic roll storage and retrieval system at Appleton, Wis. See story on p. 113. (Photo courtesy of Jervis B. Webb Co.)

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PULP & PAPER (ISSN 0033-4081), with which is combined *Paper Mill News, Paper Trade Journal* and *Pacific Pulp & Paper*, is published monthly except November when semimonthly by MILLER FREEMAN PUBLICATIONS, 500 Howard St., San Francisco, Calif. 94105. Second class postage paid at San Francisco and at additional mailing office.
POSTMASTER: Please send addresses changes to PULP & PAPER, 500 Howard St., San Francisco, Calif. 94105.

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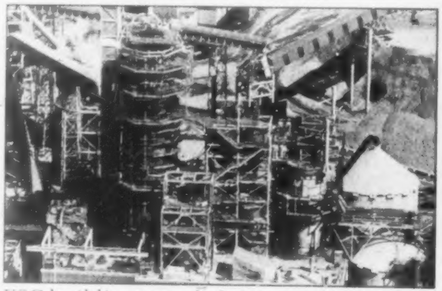

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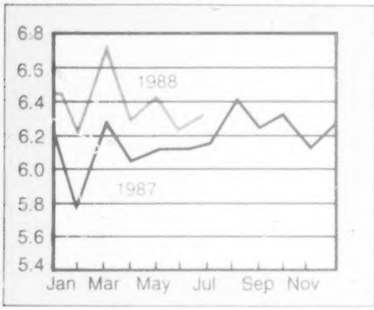


U.S. paper and paperboard production totaled 6.3 million tons in July, up just 0.8% over July 1987, according to the American Paper Institute. The relatively small year-over-year increase reflects the flat trend of growth during 1988. Because production was at record high levels when the growth trend flattened out, however, the trend rate is still up 3.8% on a seasonally adjusted, annualized basis. The rate of paper production was 38.4 million tpy through July, up 4.7% from 1987, while paperboard producers kept up a 38.1 million tpy pace, a gain of 3.0%.

Among major grades, printing and writing paper output was up 7.0% through July. Recycled paperboard was strongest among the paperboard grades, up 6.0% through the first seven months. Production of containerboard for domestic use rose 4.2%. Commerce Dept. trade data show exports of unbleached kraft linerboard down 4.2% in the first half, but market pulp exports jumped 14.2% over the same period.

Canadian newsprint shipments totaled 794,000 metric tons in July, up 1.9% from July 1987. Woodpulp exports climbed 8.3% to 706,000 tons. July operating rates were 96% for newsprint and 102% for market pulp. ■

	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION [1]					
Newsprint	July	481	4.2	5,947	3.2
Uncoated groundwood (s)	July	142	7.6	1,576	3.5
Coated paper (s)	July	592	1.4	7,374	10.3
Uncoated free sheet (s)	July	928	0.0	11,338	5.6
Other printing/writing	July	121	9.0	1,518	12.1
Total packaging and other paper (s)	July	404	3.1	5,161	2.2
Tissue	July	444	2.3	5,410	3.5
Total paper	**July**	**3,110**	**0.9**	**38,323**	**5.2**
Unbleached kraft paperboard	July	1,620	-1.8	19,358	4.0
Semichemical medium	July	480	1.9	5,688	1.6
Bleached paperboard	July	389	4.6	4,478	0.6
Recycled paperboard	July	691	4.1	8,872	6.0
Total paperboard	**July**	**3,178**	**0.7**	**38,397**	**3.5**
Total U.S. paper and paperboard output	**July**	**6,288**	**0.8**	**76,720**	**4.3**
PULP, WASTEPAPER & FIBER [2]					
Total U.S. woodpulp production	June	4,964	0.1	60,744	3.2
Market pulp production	June	700	1.2	8,304	5.4
Wastepaper consumption at paper/board mills	June	1,563	6.0	18,918	4.9
Pulpwood consumption (cords)	June	7,689	0.4	96,382	2.3
CONVERTED PRODUCTS STATISTICS [3]					
Corrugated box shipments (billion ft²)	July	24.470	3.7	178.192[6]	3.2
Containerboard inventories at U.S. box plants and mills	July 31	2,615	9.6		
INTERNATIONAL TRADE [2]					
U.S. paper imports (including products)	June	1,051	-0.8	12,856	3.6
Imports of Canadian newsprint	June	820	11.9	10,176[6]	1.3
U.S. paper exports (including products)	June	474	7.3	5,810	13.2
Exports of unbleached kraft linerboard	June	175	-20.6	2,159	-4.2
Exports of woodpulp	June	497	9.2	5,416	14.2
Norscan pulp inventories[4]	July 31	809	-15.7		
Norscan pulp operating rates[4]	July	103%	96%	90%	99%
CANADIAN STATISTICS [5] *(reported in metric tons)*					
Total newsprint shipments	July	794	1.9	5,668[6]	0.9
Operating rates	July	96%	92%	99%	98%
Inventories held by U.S. consumers	July 31	1,557	8.8		
Other paper/board shipments	July	532	3.9	3,902	6.1
Woodpulp shipments (export only)	July	706	8.3	4,722	2.0
Operating rates	July	102%	101%	97%	97%

1. American Paper Institute 2. API, Bureau of Census, American Pulpwood Assn. 3. Fibre Box Assn., Paperboard Packaging Council 4. North American/Scandinavian paper-grade market pulp 5. Canadian Pulp & Paper Assn. 6. Not annualized (s) = Shipments

Paper-grade chemical market pulp: Pulp bull market may begin to slow in 1989

Grade structure: Chemical paper-grade market pulp is sold in the open market and does not include captive pulp used onsite or shipped to affiliated mills within North America. Pulp is divided into grades based on whether it is made from softwood or hardwood fiber, whether it is produced by the sulfate (kraft) or sulfite pulping process, and whether it is bleached, semibleached, or unbleached.

Northern bleached softwood kraft (NBSK) is the premium pulp grade because of its long fiber length and strength. U.S. chemical paper pulp statistics include about 1.7 million tons of fluff pulp production (including exports) used in diapers and other absorbent hygiene products. Dissolving and mechanical pulp grades are excluded from the statistics.

Production/capacity: The strong pulp market has continued in 1988, with Canadian and U.S. chemical paper-grade market pulp mills expected to run close to 100% of capacity for the second year in a row. The market for softwood remains tight despite the recent peaceful settlement of British Columbia labor negotiations, while hardwood pulp is only somewhat more available.

Latest pulp inventory statistics suggest that the bull market in pulp still has a ways to go. North American and Nordic producer pulp inventories dropped to another low in the current cycle of 670,000 metric tons at the end of June.

For all of 1988, U.S. production of chemical paper-grade market pulp is expected to be up 4% this year, resulting in an operating rate of more than 101%. Canadian production is projected to be up about 1% in 1988, resulting in operating rates of about 99%. (The operating rate figures are based on 1987 capacity survey numbers, which probably will be revised upward for both countries.)

Future outlook: The pulp market is expected to remain relatively strong through 1989, although it could weaken in the second half if the U.S. economy begins to slow significantly next year.

Any weakness would probably first appear in hardwood pulp, which has been in somewhat more available supply and will be facing the most competition from 600,000 tpy of new bleached chemi-thermomechanical market pulp (BCTMP) capacity coming onstream in Canada. Normally, pulp market downturns lag turning points in the economy by one or two years, but this time the decline in the pulp market could come more quickly because of the lofty level of pulp prices and high profit margins of North American producers.

Nevertheless, limited capacity growth should help restrain the severity of any downturn. U.S. chemical paper-grade market pulp capacity is expected to rise only 0.8% in 1989 and remain relatively flat in 1990. Canadian capacity is expected to decline 1% in 1989. Even with the inclusion of the new BCTMP capacity, Canadian paper market pulp capacity is expected to rise only 1.9% in 1989.

World market pulp capacity growth will not increase much until the early 1990s, when at least 1.8 million tons of new market pulp capacity will be starting up in Latin America.

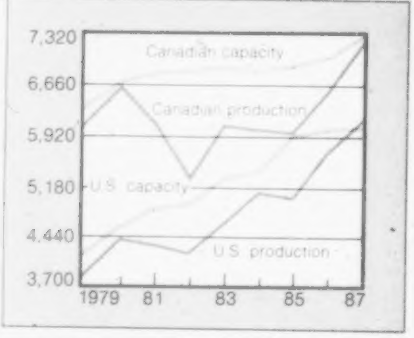
Pricing: North American pulp export prices in Europe have risen for 11 consecutive quarters, with the price of benchmark NBSK hitting $760/metric ton in the third quarter of 1988—nearly double its level at the end of 1985. The pattern will probably be broken in the fourth quarter of 1988 due to the recent strengthening of the dollar, which during the summer created a roughly $50/ton gap between North American dollar pulp prices and Nordic local currency prices in Europe.

As a result, North American producers will probably leave their export prices unchanged while Nordic producers close the gap with dollar pulp prices. Meanwhile, North American producers may try to raise the domestic price of NBSK by $25/ton, bringing the U.S. level up to the export market price.

Year-end U.S. market pulp prices ($/metric ton delivered) for NBSK: 1983, $450; 1984, $510; 1985, $390; 1986, $480-$520; 1987, $610.

For additional details on market pulp demand, supply, and price trends see Pulp & Paper*'s just-released 1988* FactBook.

SUPPLY/DEMAND (000 tons)



FORECAST (000 tons)

U.S.	1986	1987	1988e
Production	5,729	6,186	6,433
Capacity[1]	6,015	6,147	6,347
Utilization rate	95.0	101.0	101.4
Imports	2,568	2,680	2,740
Exports	3,404	3,650	3,750
Apparent U.S. consumption	4,893	5,216	5,355
Canada			
Production	6,597	7,203	7,275
Capacity[1]	7,151	7265	7330
Utilization rate	92.0	99.1	99.3

e — Estimate

[1] Based on 1987 American Paper Institute and Canadian Pulp & Paper Assn. capacity surveys

TOP U.S. PRODUCERS (000 tpy)

	Annual capacity	Market share (%)
1. Weyerhaeuser	1,245	9.1
2. CP	925[7]	6.8
3. IP	800	5.8
4. Georgia-Pacific	650	4.8
5. Canfor	635	4.6
6. P&W	615	4.5
7. Repap	510	3.7
8. GN Nekoosa	490	3.6
9. MacBlo	481	3.5
10. Fletcher CC	466[8]	3.4

Capacity share of top five companies:
31.1%

Capacity share of top ten companies:
49.8%

Total North American capacity (1988)
13.677 million metric tons

1. Bleached softwood kraft. **2.** Bleached hardwood kraft. **3.** Semibleached softwood kraft.
4. Unbleached softwood kraft. **5.** Bleached sulfite.
6. Fluff pulp. **7.** Reflects consolidation of Great Lakes Forest Products (595,000 tpy) and CIP (330,000) into Canadian Pacific Forest Products.
8. Reflects 100% of Crown Forest (190,000 tpy) and 69% of British Columbia Forest Products (400,000).

Newark Group buys recycled board mill from Federal

The Newark Group has acquired Federal Paper Board Co.'s 160-tpd recycled boxboard mill in Los Angeles, Calif., for an undisclosed amount. The Newark Group is a privately owned holding company that currently operates nine recycled paperboard mills throughout the U.S., a number of converting subsidiaries, and a wastepaper trading company.

Federal also operates a 24-MW cogeneration facility adjacent to the Los Angeles mill, which it intends to sell to a separate buyer. FPB Cogen Inc. is a Federal subsidiary that supplies steam and electric power to the mill and sells excess electricity to the local public utility under a long-term contract. In 1987, the cogeneration plant made operating profits of about $2.0 million on sales of $9.0 million.

The acquisition of the Los Angeles mill will raise Newark's total recycled paperboard output to approximately 735,000 tpy. The Los Angeles mill will become Newark's tenth paperboard mill and will operate as Newark Pacific Paperboard Corp. Its clay-coated folding carton grades will be sold to independent converters in southern California. When Federal owned the mill, most of its production was converted at its own Los Angeles folding carton plant, but that facility was closed last year when Federal announced its intent to sell the mill.

• In the meantime, Newark Boxboard Co. has signed a long-term contract to buy steam from a new cogeneration plant being built by O'Brien Energy Systems. The 52-MW, $52-million plant, which will be owned and operated by O'Brien on land leased from the Newark, N.J., mill, is slated to start up in April 1990. Newark Boxboard, a subsidiary of Newark Group, has capacity for 130 tpd of bending chipboard and other kinds of board. A mill spokesman said that the arrangement will permit Newark to idle its steam boiler and will provide considerable cost savings as well as permit possible future expansion. ■

Inland Container to install first 1,000-fpm corrugator

Inland Container Corp. plans to construct a 30,000-ft^2 addition to its box plant in Biglerville, Pa., and it will install a new high-speed corrugator. The computer-controlled, 98-in. Mitsubishi corrugator is capable of running at speeds of up to 1,000 fpm. It will be the first 1,000-fpm corrugator installed in the U.S.—a similar machine is in operation in Europe, the company said.

The corrugator should have an ultimate capacity of about 100,000 tpy and produce a more uniform sheet. The plant's existing corrugator will be moved to the company's new plant in the Rio Grande Valley of Texas.

• **Union Camp Corp.** has completed a $7-million, year-long expansion and modernization of its Denver, Colo., container plant. A new 87-in. Mitsubishi corrugator was installed, which will increase the plant's capacity by about 40%—from approximately six tons/hour to eight to nine tons/hour. Also included were a new tray press, an upgraded diecutter, a new boiler, a starch system, and electrical service. The plant was expanded by 30,000 ft^2, mostly for storage of roll stock and finished goods. ■

Lin Pac opens its first West Coast plant

Lin Pac Inc. recently opened a new corrugated sheet feeder plant in City of Industry, Calif.—its first operation on the West Coast. The plant has an 87-in. corrugator and is housed in a 126,000-ft^2 building. "Our intention is to sell sheets to independent corrugated converters," said general manager Jack O'Connor. The Los Angeles-area plant started up May 31 and recently added a second shift.

Lin Pac now has a total of four corrugated sheet feeder plants in the U.S., located in Atlanta, Ga.; Fort Worth, Texas; and Greensboro, N.C. The company recently sold its Philadelphia, Pa., plant to the Pratt Group, which owns Macon Kraft Inc. ■

FORECAST

Pulp capacity to grow 2.1% through 1992

Total worldwide capacity for paper-grade woodpulp is expected to grow 2.1% annually from 1987 to 1992, reaching a total of 173.2 million metric tons. Total paper and paperboard capacity is expected to increase by 2.3% during the period, reaching 260.8 million tons, according to the Food & Agriculture Organization's (FAO) latest Pulp & Paper Capacities survey. Both of these growth rates are higher than those forecast in FAO's 1986-91 study, in which woodpulp capacity was forecast to increase 1.4% and paper and board capacity was slated to grow 1.9%.

In 1987, capacity for paper-grade woodpulp was estimated at 156.5 million tons, an average annual rise of 1.8% from 1982. Capacity is expected to increase by 16.7 million tons to 173.2 million tons by 1992—a 2.1% annual rise. Capacity for paper and board in 1987 was 233.1 million tons, an average annual increase of 2.8% from 1982. By 1992, capacity is expected to rise 27.7 million tons to 260.9 million tons, a 2.3% average annual increase compared with a 2.8% increase from 1982 to 1987.

The fastest growth in paper and paperboard capacity over the next five years is forecast for the developing economies in Africa, Latin America, and Asia, which will see a growth of 3.6% annually. This is considerably lower than the 5.2% growth during the 1982-87 period. The developed-countries segment follows with a projected annual increase of 2.2%—a slight drop from the 2.3% rise for the 1982-87 period.

The developed countries will account for about 76.4% of total paper and paperboard capacity in 1992. Developing countries will have about a 10.7% share in 1992—almost unchanged from the FAO's previous survey (*P&P*, Feb. 1988, p. 33). Centrally planned economies will account for about 12.9%.

Paper grades. The FAO reports that 1987 newsprint capacity of 32.8 million represented a 0.6-million-ton increase from 1986. Capacity for this grade is expected to increase by 3.2%/year to a total of 38.2 million tons by the year 1992.

World capacity for printing/writing grades amounted to 63.5 million tons in 1987, up 3.6 million tons over 1986. World capacity for these grades is expected to grow 3.2%/year, or by 10.8 million tons by 1992.

The "other" paper and board category is 80% packaging paper and board, 10% household and sanitary paper, and 10% other grades. The FAO reports that 1987 world capacity in this category amounted to 136.8 million tons—an increase of 2.9 million tons over 1986. Capacity is expected to grow 1.6%/year, or by 11.5 million tons.

Pulp grades. The current FAO survey shows that the apparent production ratio of pulp to paper is continuing its downward trend, dropping from 73.5% in 1987 to 72.8% by 1991. Worldwide market pulp capacity in 1987 was estimated at 31.6 million tons and is expected to increase to 33.9 million tons by 1989.

Chemical paper-grade woodpulp capacity was about 107.9 million tons in 1987 and is expected to grow 1.8% annually to 117.7 million tons in 1992. Chemical pulp accounted for about 63% of total pulp capacity in 1987, with a slight decrease expected by 1992.

Mechanical pulp capacity will increase 6.1 million tons from 38.7 million in 1987 to 44.8 million tons in 1992. This can be attributed to strong growth in thermomechanical pulp (TMP), which will see an average annual increase of 7.5%. The FAO noted that developed market economies account for 96% of total mechanical pulp output and of that North America will contribute 53%. Mechanical pulp other than TMP is expected to grow by only 129,000 tons, or an annual average increase of 0.1%.

The capacity for dissolving pulp was 5.9 million tons in 1987 and was projected to reach 6.3 million tons in 1992. The capacity for other fiber pulp was 14.8 million tons in 1987, and this is expected to reach 16.8 million tons by 1992. Developing countries account for about 87% of this and will use 51% of the total in their paper furnish. People's Rep. China, with 7 million tons, accounts for 54% of world capacity, while India, with 2 million tons, accounts for 14%. ■

FAO forecasts for world pulp and paper capacity.

World woodpulp capacity, 1987-92

	Capacity (000 metric tons)		Annual average increase	
	1987	1992	1982-87	1987-92
World total	156,469	173,230	1.8%	2.1%
Developed economies	127,493	139,834	1.5	1.9
North America	78,173	84,429	1.5	1.6
Japan	12,242	13,604	0.1	2.1
Western Europe	33,166	37,604	1.5	2.5
Oceania	2,462	2,749	0.4	2.2
Others	1,450	1,450	12.6	0
Developing economies	9,856	13,745	4.6	6.9
Africa	884	1,034	8.2	3.2
Latin America	6,686	9,964	3.6	8.3
Asia[1]	2,286	2,747	6.4	3.7
Centrally planned economies	19,120	19,651	3.0	0.5
Asia	2,657	3,166	18.3	3.6
Eastern Europe	4,413	4,435	1.4	0.1
U.S.S.R.	12,050	12,050	1.4	0

World paper and paperboard capacity, 1987-92

	Capacity (000 metric tons)		Annual average increase	
	1987	1992	1982-87	1987-92
World total	233,114	260,854	2.8%	2.3%
Developed economies	178,503	199,289	2.3	2.2
North America	88,358	96,856	1.8	1.9
Japan	25,286	28,473	2.1	2.4
Western Europe	60,266	68,879	3.0	2.7
Oceania	2,565	3,010	0.3	3.3
Others	2,028	2,071	5.4	0.4
Developing economies	23,379	27,864	5.2	3.6
Africa	1,093	1,270	7.7	3.0
Latin America	12,705	14,767	4.3	3.1
Asia	9,581	11,827	6.1	4.3
Centrally planned economies	31,232	33,701	4.4	1.5
Asia	10,512	12,532	12.9	3.6
Eastern Europe	6,720	7,169	1.0	1.3
U.S.S.R.	14,000	14,000	1.5	0

1. Figures for Asia are divided by type of economy.
Source: Food & Agriculture Organization of the U.N.

FINE PAPERS

Weyco Canada starts up machine in Prince Albert

Weyerhaeuser Canada Ltd. started up its new 210,000-metric-tpy uncoated free-sheet machine in Prince Albert, Sask., on Aug. 29. The machine produced about 100 tons of alkaline paper on its first day. Some 95% of that paper was salable and two reels were sold to a customer in Pennsylvania, a spokesman said.

The C$250-million greenfield mill adjacent to an existing market pulp mill will produce communication papers, such as business forms stock, copy paper, and computer stock, according to Joe Ralko, public affairs manager for Weyerhaeuser Canada's Saskatchewan Div.

Weyerhaeuser purchased the pulp mill in 1986 and agreed to build the paper mill within three years, or no later than December 1989. Later, construction plans called for startup in early 1989, but the company beat that schedule because "there were no labor problems," Ralko said. He said the project was the largest open merit shop (nonunion) of any industry in Canada. The main contractor, Saskatoon Construction, a subsidiary of BE&K, was not unionized and unions failed to gain certification at the subcontractors, Ralko said.

Valmet-Dominion provided a 318-in.-trim paper machine. Process control systems were from Impact Systems and AccuRay. H.A. Simons was

Traditional Na/S balance: battleground for commodity suppliers

COOKING. The continued climb of caustic soda prices has begun to influence the way mills make up liquor for kraft pulping. Last year's reported 30% rise in caustic price has been repeated—cost for all grades of caustic breached the $200/ton level. Mills are currently reevaluating the conversion to soda ash, and some mills have already signed purchase orders for carbonate. On the sulfur side, demand for emulsified products is still growing feverishly. But sulfur prices to these suppliers are rising too, and forecasts call for an increase in demand for outside saltcake due to its more attractive price and availability.

Production of pulp through the kraft cooking technique surged upward again in 1987. In Canada, all kraft production rose 6.2%, but 1988 will achieve less than half that gain. Capacity for kraft pulp in Canada will climb higher due to a spate of expansions, including a new pulp mill at Peace River, Alta. (Daishowa Canada Corp.), a new line at Howe Sound, B.C. (joint Oji Paper Co. Ltd. and Canfor Corp.), continuation of the project at Windsor, Que. (Domtar Inc.), upgrades at Crofton, B.C. (British Columbia Forest Products Ltd.) and Hinton, Alta. (Weldwood Ltd.), and several others accounting for C$2 billion in expenditures through 1992.

In the U.S., sulfate production grew about 5% in 1987, and 1988 shows signs of a still bullish 3.5% gain. U.S. producers also acknowledge extended healthy demand. New kraft pulping lines have been announced for Columbus, Miss. (Weyerhaeuser Paper Co.), Samoa, Calif. (Louisiana-Pacific Corp.), Calhoun, Tenn. (Bowater Southern Paper Co.), Bennettsville, S.C. (Willamette Industries Inc.), and most recently at Port Westward, Ore. (WTD Industries Inc.). More expansions are completed or under way at another dozen mills.

The high operating rates of the existing kraft pulp mills ensure some stability to the present suppliers. New or substitute suppliers are scrambling for new territory now, anticipating the economic cycle to reverse, perhaps late in 1989. Saltcake suppliers believe that discounting of their products will soon be curtailed and that the list price will firm. Tightening of sulfur supply, high caustic prices, and high-capacity utilization of mills are the reasons given. The economic realities behind soda ash conversion from caustic are slowly being absorbed. Transportation rates from Green River, Wyo., and the volume purchase agreements stipulated by contracts had been the driving forces for mill conversions. The widening price differential and tight long-term caustic supply outlook are appealing to every kraft mill site. Evidence is also seen from supplier movement.

General Chemical is seeking a patent for its conversion process known as GCH-4, and a new soda ash producer has emerged in Cortland, N.Y. (Natrium). This new supplier is playing the same regional game that Riverside Products (Cartersville, Ga.) played in 1984. The bigger players are indicating that they support these developments, hoping that converters will bring them in as major suppliers and retain the local sources only as substitute or complementary suppliers. In summary, the soda ash producers are running close to full, and supply is tightening rapidly. List prices are firm and may go higher. Reports indicate that 10% to 15% of kraft mills switched during 1988, while many others retained suppliers for quotes.

New pulping technologies are also receiving commercial attention. Chlorine dioxide generators that produce little or no salt are being installed, helping site-ready products such as emulsified sulfur into makeup loops. Extended delignification has been applied with success at more new or expanded lines. Oxygen delignification seems to be popular too, as mills seek to bleach less and apply more front-end pulping. Ethanol pulping is being tried at Repap Enterprises Corp. Inc., and a new line using the S-pulping technique has been announced in Saskatchewan. The former mentioned technologies are well accepted but will not play a major role in shifting makeup chemicals. The latter two may have far-reaching effects on pulping, should they be commercially successful.

RECOVERY. The U.S. Bureau of Mines reports that lime production increased 8% over 1987, with big gains registered by the chemical, industrial, and refractory segments. In the kraft pulping industry, strong production helped lime shipments increase 5%. Lime producers are not very interested in this segment of the industry, as new kiln, slaker, and computer-control equipment have brought lime makeup requirements steadily downward on a production (lb/ton) basis. The new area for these suppliers is the advent of onsite calcium carbonate generators, which accept lime products and process them into a variety of components for filling and coating paper.

Michael Ducey

Shifts in chemicals cause upswing for kraft pulping suppliers.

Chemical	Pulp and paper consumption 1987 (short tons)	% change 1988	Price mid-1988 ($/ton)	% change 1989
Sodium sulfate	527,500	5.5	65	5
Caustic	2,225,000	7.0	225-275	10
Soda ash	900,000[1]	12.0	85	0
Lime	1,254,000	4.5	40-50	0

1. Indicates revised outlook from September column.

OUTLOOK FOR FINE PAPER, LINERBOARD TO REMAIN HEALTHY THROUGH 1992

Industry executives see a bright future for uncoated free-sheet and kraft linerboard despite predictions of a recession by 1990

P&P STAFF REPORT

For the next several years, U.S. printing/writing paper demand is expected to remain in balance, even with a slight recession predicted for late 1989 or 1990. But operating rates in Europe are expected to decline sharply as expansion outstrips healthy demand growth and exports remain flat. In contrast, to sustain a 97% operating rate from 1989 to 1991, U.S. containerboard mills will have to lift production by an average of only 1.86%/year from this year's level. These were some of the conclusions reached at last summer's Financial Analysts Federation meeting in Portland, Ore.

The strongest printing/writing grade in the U.S. in terms of capacity utilization will be uncoated free-sheet, while newsprint will be the weakest, according to Michael P. Corey, vice president corporate analysis at Champion International Corp. John C. Veness, manager-market research, English China Clays, said that operating rates for coated grades in Europe could drop to the low-80% range. U.S. uncoated free-sheet mills will average a 96% operating rate in 1992, up 1% from 1987, according to Corey. This is based on demand growth of 3.05%/year, compared with capacity additions at 2.9%, Corey said. Leading demand growth in this grade are office reprographics and forms bond papers, which Corey said are fueled by continued proliferation of office copying systems and personal computers. Reprographics will advance about 6%, while forms will follow at 5%.

Offset printing also will continue to grow, but demand in envelope papers probably will not grow as fast due to the substitution of electronics for some of its transactional applications. Growth in envelopes will be about the same as real gross national product (GNP), or about 2%/year.

NEWSPRINT RATES TO DIVE. Newsprint will drop to about 90% in 1992 from its 1987 rate of 95% utilization. In fact, Corey predicted that capacity will advance almost twice as fast as demand over the next few years. Demand growth is expected to be 3.4%/year through 1992, but shipments probably will rise only 1.9%.

The overwhelming number of new machines may cause some companies thinking of adding new capacity to abandon, or at least postpone, those additions, Corey said. Demand is based upon circulation growth and advertising pages. Circulation has been moderate in recent years and will likely continue at that pace. Sales of ad space probably will mirror GNP, according to Corey. In addition, rising prices for newsprint may renew publishers' interest in paper conservation, thereby moderating demand increases, he said.

COATED PAPERS IN BALANCE. The demand for coated groundwood papers will be stronger than the supply through 1992, with shipments growing about 4.2%/year compared with 3.9% annual capacity growth. This will put mill operating rates at 93% in 1992, up from 92% in 1987. Coated free-sheet grades operating rates will decline slightly as capacity rises 5.1% compared with new demand at 4.5%. This should lead to utilization of 93% in 1992, compared with 95% last year, Corey said.

The strongest growth for coated papers will lie with such end uses as newspaper advertising inserts, catalogs, and other commercial printing. Magazines also may do relatively well. Corey suggested that all of these segments will grow by at least 4%/year through 1992.

Uncoated groundwood paper operating rates are expected to drop slightly from 95% in 1987 to 94% in 1992. Corey's estimates are based on annual demand growth of 2.9% and a 3.3%/year capacity advance. Groundwood papers will do best in what are already their largest end uses. Those rising 4.0%/year or better through 1992 will be periodicals other than magazines (Sunday newspaper magazines), commercial printing (inserts and flyers), and business forms. Magazine use of groundwood will advance by just over 1%, as will book publishing, Corey said.

EUROPEAN MARKET NOW STRONG. European mills produced about 18 million metric tons of uncoated free-sheet and uncoated groundwood grades in 1987, according to Veness. Domestic demand amounted to about 15.84 million tons. A little over 2 million tons were exported, about half of which were shipped to the U.S.

Veness estimated that the European printing/writing industry has capacity to produce about 19.1 million tons of paper. Total operating rates for most grades were in the mid- to upper-90% range. He said it was only the uncoated free-sheet and uncoated groundwood that brought the average for all printing/writing grades down to about 94%.

For much of 1987, European suppliers of coated groundwood papers, and to a lesser extent uncoated groundwood papers, were giving such long delivery times that they may as well have been on allocation, Veness said. Uncoated free-sheet papers, however, suffered from an excess of supply due to new capacity that came online in 1986-87 and market growth of less than 2% last year.

TOO MUCH EXPANSION? Veness forecast that about 5 million metric tpy of additional printing/writing capacity will be in place in Europe by 1992. This figure includes both announced and proposed projects—and might be a conservative estimate. About 3.5 million metric tons of this will be coated.

Where will the 5 million metric tons be sold? The major determinant of the printing/writing paper demand hinges on the health of the overall economy, particularly advertising and business papers demand. Veness forecast that European GNP will grow by approximately 2%/year through 1992, which he characterized as a moderate outlook. In tonnage terms, advertising is the more important factor, accounting for between two-thirds and three-quarters of total printing/writing paper consumption (and about 90% of coated paper demand).

Total advertising spending in Europe has exceeded GNP growth for quite a few years, and Veness expects this to continue for some time. Veness pointed out that television in Europe, with the exception of Italy, places fairly strict limits on the amount of commercials it broadcasts. This forces advertisers to turn to print. Through direct mail, print also has the advantage of being able to target specific consumers.

The cloud on the horizon is that when (and if) TV is deregulated, paper demand could be cut, especially in the mass circulation magazines. Veness said a mitigating factor could be that demand for TV advertising is pent up—that is, these ads have not yet been placed anywhere. Also, growth in total advertising spending may increase significantly.

Office papers account for 20% of total printing/writing paper demand and over half of uncoated free-sheet demand. Veness emphasized that the "paperless" office does not appear to be anywhere on the horizon. Rather, he pointed out that office copiers seem to have an insatiable demand for paper. He also expects to see facsimile machines running on standard uncoated stock before the year 2000. On the other hand, modems could cut down the use of printouts from personal computers.

OPERATING RATES TO PLUNGE. Veness expects total European printing/writing paper demand to grow by 2.5 million tons by 1992, bringing total demand to 18.35 million tons—a growth rate of about 3%/year. Coated paper demand is expected to increase by 4.5%. Veness expects uncoated groundwood paper will lose market share to coated groundwood. He characterized these last two grades as "average performers."

European capacity will grow about 4%/year, or 4.9 million tons. With demand expected to grow by only 2.5 million tons, 2.4 million tons of excess paper will be on the market. Traditionally, the gap has been filled by exports. Veness predicted that the net volume of exports in 1992 will be at the same level as in 1987.

This would put the operating rate for European mills in 1992 at 85%—down from 94% in 1987. He noted that mills in Europe still make money in the low-80% range. The operating rate for coated free-sheet would be 82% (down from 94%), with coated groundwood at 80% (down from 97%) and uncoated free-sheet at 88% (down

TABLE 1: **U.S. uncoated free-sheet mills will average a 96% operating rate in 1992, up 1% from 1987.**

Grade	1988-92 Average annual growth rate (%)	1987 shipments (000 tons)	1992 shipments (000 tons)
Total Coated free-sheet	**4.5%**	**3,078**	**3,770**
No. 1	5.0	381	475
No. 2	3.6	303	355
No. 3	5.3	1,060	1,340
No. 4	4.6	760	935
No. 5	5.2	152	190
Coated one side	2.5	422	475
Coated free-sheet capacity	5.1	3,237	4,085
Total coated groundwood	**4.2**	**3,781**	**4,065**
No. 4	4.5	613	750
No. 5	4.0	3,168	3,810
Coated groundwood capacity	3.9	4,132	4,930
Total uncoated free-sheet	**3.0**	**10,982**	**12,655**
Bond/reprographic	4.2	2,858	3,455
Offset	2.5	2,832	3,185
Forms bond	3.6	2,155	2,540
White wove envelope	2.3	916	1,020
Carbonless	5.0	599	750
Tablet	—	425	425
Cover and text	1.8	329	360
Other	2.1	868	920
Free-sheet capacity	2.9	11,520	13,170
Total uncoated groundwood	**3.5**	**1,485**	**1,745**

Source: Champion International Corp.

from 90%). About 75% of the new tonnage coming onstream will be at integrated mills.

In 1992, tariff barriers in the European Economic Community are slated to be eliminated. Veness expects that this will lead to increased merger activity. He expects mills to emphasize higher-value-added products and to look to export more. He maintained that the European printing/writing industry will remain a healthy, prosperous industry.

U.S. CONTAINERBOARD MILLS SET FOR SUCCESS. To sustain a 97% operating rate from 1989-91, U.S. containerboard mills will have to lift production by an average of only 1.86%/year from this year's level, forecast Michael R. Onustock, vice president of Willamette Industries Inc. Based on American Paper Institute figures, Onustock expects linerboard and medium production to grow by 5.0% from 1987 levels to 26.613 million tons this year. With capacity for 26.912 million tons, mills will be operating at 98.9% of capacity in 1988. The 97% operating rate will be attainable if output grows by 1.4% in both 1989 and 1990 and 2.8% in 1991.

This year, the U.S. will have capacity for 18.487 million tons of unbleached kraft linerboard, 138,000 tons of solid bleached linerboard, and 587,000 tons of recycled linerboard. By 1991, capacity will grow to 19.825 million tons, 146,000 tons, and 746,000 tons, respectively.

Corrugating medium capacity this year will amount to 5.833 million tons of semichemical medium and 1.867 tons of recycled medium. By 1991, U.S. capacity for semichemical will grow by 7.6% to 6.278 million, while recycled medium capacity will grow 6.9% to 1.996 million tons. Onustock expects to see less heavy capital investment in the future. He noted that incremental capacity expansions achieved by installation of a wide-nip press will be the industry's main vehicle for capacity growth. (Reports are that orders for this equipment are so strong that it now requires over two years' lead time to get one installed.)

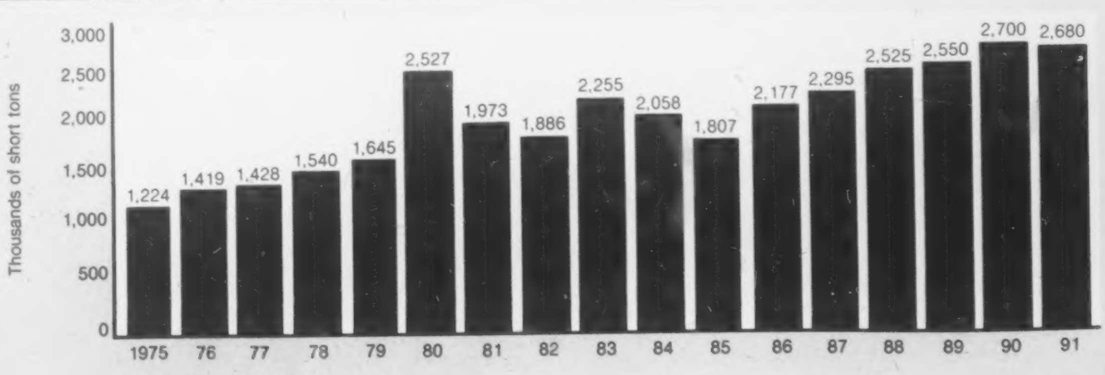
BIG OPPORTUNITIES OFFSHORE. Victor A. Casebolt, senior vice president-kraft paperboard and packaging for International Paper Co., discussed the export market for U.S. paperboard. He estimated that the 1988 global market for containerboard is approximately 67.2 million short tons, about 36% of which will be consumed in the U.S. The Far East will consume 25%, and Western Europe will consume 20%. These three areas account for over four-fifths of total world consumption. Casebolt forecast that by the year 2000, the Far East will surpass the U.S. as the leading consumer of corrugated.

Between now and the year 2000, demand for containerboard will increase by 31 million tons to 98 million tons. Casebolt noted that this is equal to 88 new 1,000-tpd paper machines and observed that the U.S. has brought on only two new containerboard mills in this decade, one of which is IP's Mansfield, La., mill. Outside the U.S., only two world-scale mills were brought on in the 1980s—both in South Africa. Casebolt concluded that demand will have to be satisfied by rebuilding and upgrading mills.

FORECAST OF FUTURE DEMAND. Casebolt expects average annual world growth of 3.2% between now and the end of the century. The leader will be People's Rep. China with about 9% average compound annual growth rate. Latin America and Africa will grow by about 4%; the U.S., Western Europe, and Japan by 2.5%; and Canada by 1.5%. People's Rep. China, which has a scarcity of fiber, represents the number one export opportunity within this time, Casebolt said.

He expects kraft linerboard and semichemical medium world demand to grow by 2.2% and 1.9%, respectively. Demand for recycled linerboard and medium will

FIGURE 1: **Forecast of U.S. linerboard exports, 1975-1991.**



Source: International Paper Co.

grow by 4.7% and 4.9%/year. Growth of recycled linerboard capacity will be stimulated by the economics of building a recycled mill vs a kraft mill. For a 1,000-tpd recycled mill with an after-tax return of 12%, Casebolt estimated that the capital cost to build a new recycled mill is about $260,000/daily ton and would require a sustained linerboard price of $420 to $450/ton. For a kraft linerboard mill, the cost increases to $350,000/daily ton, requiring a linerboard price of $450 to $480/ton.

Between 1975 and 1987, U.S. kraft linerboard exports increased by 1 million tons, and Casebolt assumes that a similar increase will occur in the next 12 years, bringing U.S. linerboard exports to almost 3.5 million tons by 2000. (Exchange rates could alter this.) Overseas demand in 1988 should increase 10% to just over 2.5 million tons. Casebolt forecast an average growth rate of 2%/year through 1991. The two major exporters of kraft linerboard, the U.S. and Sweden, account for about 64% of world's exports, and this dominance should continue.

LIQUID PACKAGING BOARD DEMAND TO SOAR. Worldwide demand for bleached board was 5.6 million tons in 1987. The U.S. is the major producer, accounting for 78% of the world's 5.9 million tons of capacity. Sweden has 9%, and Finland has 6%.

The U.S. is a net seller of bleached board. It supplies 4.5 million tons, consumes 3.9 million tons, and exports 600,000 tons. Of the latter, 70% is bleached liquid packaging board. U.S. exports of this grade should reach 650,000 tons in 1991, Casebolt projected.

World demand for liquid packaging board was 1.5 million short tons in 1987. This should reach 2.0 million tons in 1995. The U.S. accounts for 37% of world demand of liquid packaging board, or 550,000 tons in 1987, of which 70% was milk cartons and about 23% was juice cartons. Western Europe consumes approximately 25%, while Japan consumes 17%. Demand growth in the U.S. will average 3.0%/year. Growth will be faster in other parts of the world, and world demand growth for liquid packaging board should be 4.3%/year. In the past ten years, the biggest U.S. export markets for liquid packaging board were the Far East, Canada, and Japan. Western Europe has reduced its imports from the U.S. due to competition from the Nordic countries. Japan, Canada, Mexico, Singapore, and Rep. Korea present particularly good export opportunities for the future, Casebolt said.

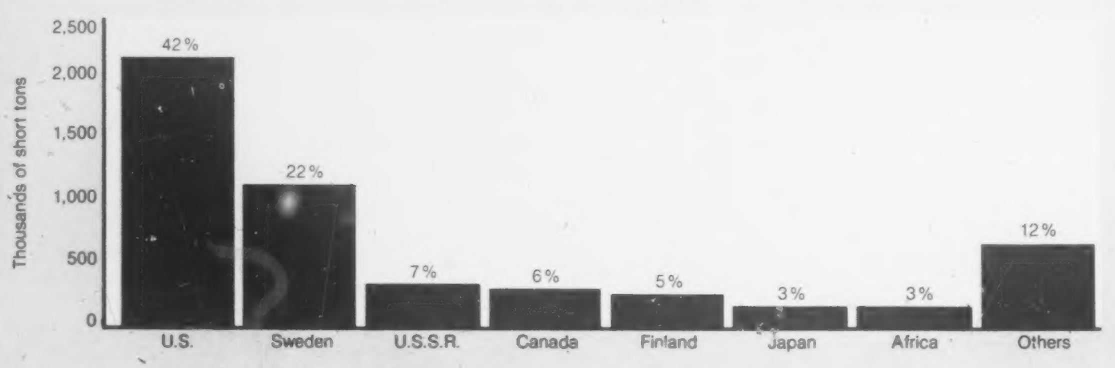
EMPHASIS ON QUALITY. The traditionally commodity-oriented U.S. containerboard/corrugated box industry recently has been placing increased emphasis on the quality and value of its products, according to Frederick V. Ernst, group vice president, Chesapeake Corp.

This change has been brought about by a number of factors. Increased concentration has resulted in a new sense of industry leadership. Also, concern about plastic competition in the packaging field has been growing. Finally, changes in the U.S. distribution system (from rail to truck) and in retail marketing have occurred. As a result of such pressures, the industry has been trying to produce linerboard with greater stacking strength, increased porosity, and more graphic appeal, he noted.

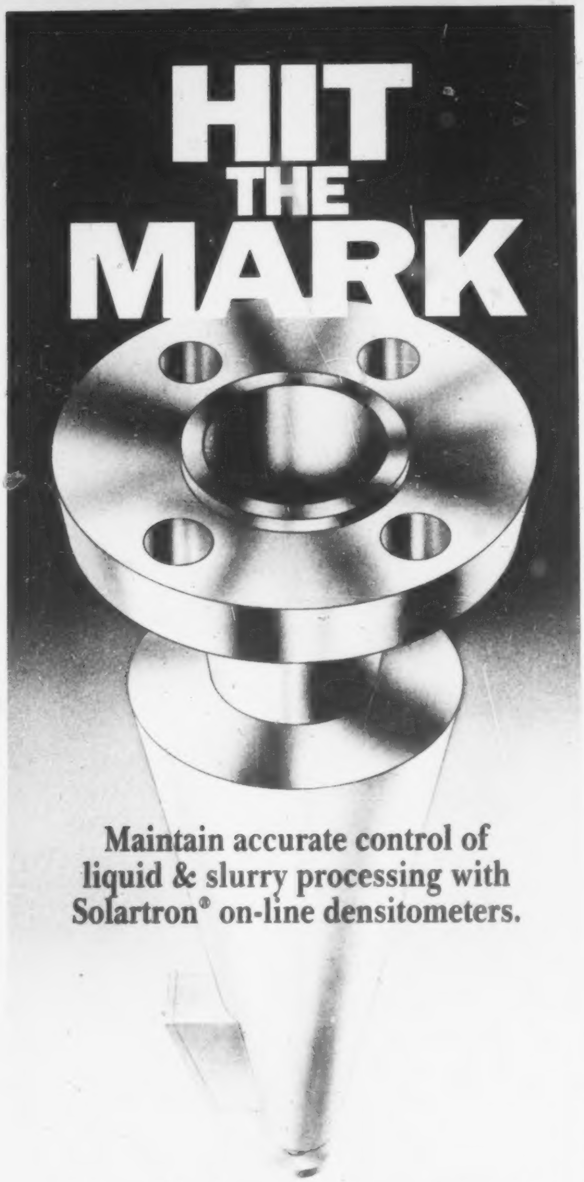
Chesapeake's new No. 3 Tri-Kraft machine is a response to a number of these requirements, particularly for linerboard with a low-cost white printing surface. The machine serves the market for point-of-purchase display, where packaging design and graphics are used to influence purchasing decisions at the retail level.

Point-of-purchase packaging offers a number of advantages: it is less expensive than advertising and promotion, substitutes for experienced sales personnel in mass merchandise outlets, and reinforces the trend in retail sales toward impulse buying. One study recently found that two-thirds of all buying decisions in supermarkets were made in the store, Ernst noted.

FIGURE 2: **Leading kraft linerboard.**



Source: International Paper Co.



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He said four categories of board currently serve the point-of-purchase display market:

- Litho-laminating is the result of high-quality coated paper being preprinted and then laminated to corrugated board. This is the most expensive technique but offers the highest graphic quality.
- Coated board is used primarily in the preprint process before linerboard and medium is combined into sheets. Graphic quality is high and cost can be lower than litho-laminating if production runs are large enough. However, minimum order size forces box plants to make runs beyond the immediate order and makes it expensive for the end user to change design quickly. Capacity for preprint has grown rapidly in the last five years but still has not resolved its marketing problems. As a result, consumption of coated board is still believed to be small.
- Bleached linerboard is used in preprinting and postprinting (the typical process in which printing follows corrugating). Graphic quality is lower, but the market is well established and growing. In 1987, U.S. uncoated solid bleached linerboard production totaled 137,000 tons and has been growing at a 4.4%/year rate since 1980. As preprint process grows, bleached and coated linerboard demand should rise sharply, Ernst said.
- Mottled linerboard is by far the largest type of linerboard used to improve graphic display. It is used in either preprint or postprint to upgrade brown boxes or as an inexpensive substitute for uncoated bleached board. The irregular surface of most mottled linerboard limits its use as a satisfactory printing surface. However, U.S. production of mottled in 1987 exceeded 1 million tons and has been growing at a 7.7%/year rate since 1980. It has the lowest cost of the four types of board now used for making point-of-purchase displays and boxes.

Chesapeake plans to use its new No. 3 machine to produce two new grades to better serve this market. Already this spring, the company began producing Tri-Lite, an improved mottled liner that is said to offer greater surface uniformity. Its three-ply structure also offers better compression strength. The company is additionally developing Tri-Brite, a white-top board, which will compete with solid bleached linerboard.

The new white-top board "should be ideal for the preprint market, which is still looking for a low-cost substrate that can open up the volume end of the high-quality graphics market," Ernst said. The company hopes to introduce the new grade in the second half of 1988 and has projected that about 20% of its paperboard volume in 1987 will consist of the two white grades.

Ernst also indicated that the company is solving some earlier operating problems with the complex Tri-Kraft machine. The machine, installed in 1986, has a capacity of about 315,000 tpy. Production rose from 65% of capacity at the beginning of 1987 to about 80% by the year's fourth quarter, and further improvement is being made this year. ■